

DEPARTMENT OF THE INTERIOR

REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

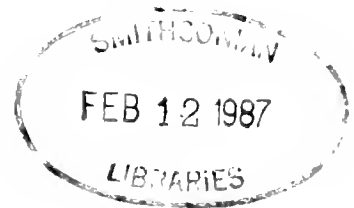
OF

THE TERRITORIES.

F. V. HAYDEN,

UNITED STATES GEOLOGIST IN CHARGE.

VOLUME A.



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1876.

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LETTER TO THE SECRETARY.

OFFICE OF UNITED STATES GEOLOGICAL AND GEOGRAPHICAL
SURVEY OF THE TERRITORIES.

Washington, March 1, 1876.

SIR: In presenting to the public the present monograph by Dr. Packard, I feel assured not only of the hearty approval of all entomologists, but also of scientific men generally.

I deem it one of the most important parts of the work of such surveys, second only to their chief object, to seize upon the opportunity of completing such monographs as the present; otherwise, materials which individuals and various expeditions have been collecting, may remain for years in private or public museums, or perhaps be destroyed, without any systematic arrangement ever having been made. But this is not the only and greatest benefit to be derived from such monographs as the present: it is practically useful as an assistant in the economic entomology of our country, as this memoir embraces one of the most injurious groups of Lepidopterous insects.

These monographs also enable those who are constructing elementary works, for the use of our colleges and schools, to bring into harmony and properly systematize the whole. In fact, so great is the want that is now felt in this respect that I have been called upon to furnish a limited number of copies to some of our Western institutions, to be used directly in instructing the more advanced classes.

The time has come in this country when monographs, complete and exhaustive in reference to the field embraced, are demanded: and no more important work can now be done in natural history than to bring out such memoirs where the facts and material are sufficient.

I therefore feel assured that not only scientists, but the entire educated portion of our people, will give their hearty encouragement in this work. Such publications are monuments which will, in years to come, point back to the wisdom of the liberal policy adopted by Congress in aiding the prosecution of this Survey, and allowing it that latitude which enables it thus to work up fully and exhaustively not only the immediate material obtained,

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but to complete the work in various groups in cases where specialists are prepared to do so.

Other monographs are in an advanced state of preparation, based on the collections of the Survey, which will be printed as soon as they can be rendered more complete by farther investigations in the field.

Very respectfully, your obedient servant,

F. V. HAYDEN,

United States Geologist.

Hon. Z. CHANDLER,

Secretary of the Interior.

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UNITED STATES GEOLOGICAL SURVEY OF THE TERRITORIES.

A

MONOGRAPH

OF THE

GEOMETRID MOTHS OR PHALENIDÆ

OF THE

UNITED STATES.

By A. S. PACKARD, JR., M. D.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876



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PEABODY ACADEMY OF SCIENCE,

Salem, Mass., August 10, 1875.

DEAR SIR: I beg leave to transmit to you a monographical account of the North American species of Geometrid moths. The material which was collected by Lieut. W. L. Carpenter, in Colorado, in 1873, while attached to your party, and by others in the same Territory, added to extensive collections received from the Pacific States, as well as the Atlantic States, have made me anxious to treat the subject more thoroughly, and enlarge upon the slight sketch published in your Annual Report for 1874.

That I can do this in the present form is due to your enlightened interest in the connection of biological with geological and geographical science. By an attentive study of the insect fauna of the plateaus and mountains of Colorado and adjoining Territories, we are led to comparative studies of the physical features of those regions with the elevated plateaus of Asia. The comparatively few specimens previously received from Colorado indicate a similarity in its fauna to the Ural and Altai Mountains, most striking and unexpected to myself, and perhaps to most persons.

Besides the relations to comparative physical geography and the geographical distribution of animals, it is believed that an extended examination of the existing insects of the Western States and Territories will throw light on the extinct forms which abound in the Tertiary formation in those regions, and which have been partially worked up by Mr. S. H. Scudder, the eminent paleontologist, on materials discovered within the limits of Colorado and Utah. For this purpose in part, at least, much attention has been devoted in the illustrations accompanying this report to the venation of the wings of each genus of the family, as well as to the anatomy of the hard parts of these insects which are more likely to be preserved fossil.

From an economical point of view, a systematic account of the species of this family, comprising the measuring or span worms, so many of which are injurious to vegetation, will, it is hoped, prove useful to agriculturists; and it is believed that a volume on these injurious insects, largely represented

in the Western States, for fully one-half if not more of my material has come from the Western States, will not be out of place in a series of works illustrative of the extinct and living animals, now in course of publication under your direction.

In closing, allow me to express my appreciation of the impetus you have already given by the reports published under the auspices of the survey to our knowledge of the insects of the Rocky Mountains, and to thank you for the kind interest you have taken in the preparation of this work, and for the increased value you have given it by extending to me the hospitalities of the survey for a few weeks in Colorado and Utah during the present season. I have thus been enabled to add greatly to the usefulness of the essay to western entomologists.

I am, sir, with much respect, yours, very truly,

A. S. PACKARD, JR.

Prof. F. V. HAYDEN,

*Geologist-in-charge of the U. S. Geological and
Geographical Survey of the Territories, Washington, D. C.*

INTRODUCTION.

The *Phalanidae* are a family of moths of great extent. There are eight hundred species of this family enumerated in Staudinger and Wocke's Catalogue of the Lepidoptera of Europe. In the present work, between three and four hundred species are described, and it is not unlikely that nearly a thousand species will be found on the continent north of Mexico and the West Indies. The limits to which this work is confined are all of America north of Mexico and the West Indies, *i. e.*, all north of the southern boundary of the United States, including British America, Arctic America, and Greenland, as the latter belongs to the same (circumpolar) fauna as Arctic America, while the insects of the coast of Northern Labrador are in many cases identical with those of Greenland.

I will now enumerate the sources from which my material has been derived, beginning with the Arctic regions, Labrador, British America, and going down by way of the alpine summits and lowlands of New England to the Middle and Southern Atlantic States, thence to the Southeastern States, to the Trans-Mississippi States, to Colorado and the Rocky Mountain region, closing with the Pacific region, beginning with Vancouver Island and ending with Southern California. The acknowledgments are made in this order in giving the habitats of the different species:

1. Specimens of geometrid larvæ and adult *Glucopteryx* from Polaris Bay, Northern Greenland, collected by Dr. E. Bessels, the scientist of the United States Polaris Expedition. Specimens from Greenland, Iceland, Lapland, and the Swiss Alps, named and forwarded by Dr. O. Staudinger.

2. Collections made in Southern Labrador, Straits of Belle Isle, by myself and members of the Williams College Expedition to Labrador and Greenland, in 1860. Larger collections made by myself along the coast, from the Straits of Belle Isle to Hopedale, with specimens received from Okkak, Labrador, through the Moravian missionaries.

3. Collections made in the alpine, subalpine, and lower regions of Mount Washington, New Hampshire, by Messrs. F. G. Sanborn, S. H. Scudder, H. K. Morrison, and myself; also, a small number taken on the Saskatchewan River, British America, by Mr. Scudder, and a few species from Quebec, collected by Prof. F. X. Bèlanger, with a collection from London, Canada, accompanied by notes on the early stages by Mr. William Saunders.

4. Collections made in the New England States by Dr. T. W. Harris and Rev. Mr. Leonard, and contained in the Museum of the Boston Society of Natural History, with unpublished notes of dates of capture and localities, which I have been freely allowed to use. The specimens in the Museum of the Peabody Academy of Science, Salem, the Museum of Comparative Zoölogy, and collections made by Messrs. F. G. Sanborn, H. K. Morrison, C. S. Minot, S. H. Scudder, S. E. Cassino, Frank Very, G. Dinmock, F. W. Putnam, A. E. Verrill, S. I. Smith, C. G. Atkins, F. S. Scribner, S. H. Peabody, L. W. Goodell, J. H. Emerton, and myself.

5. Collections from the Middle Atlantic States, from the American Entomological Society, Mr. A. R. Grote, the late Dr. Brackenridge Clemens, Messrs. James Angus, J. A. Lintner (whose fine series have been of special interest and value), Mr. Meske, Mr. Stultz, Mr. Graef, Mr. Smith, Professor Comstock of Cornell University, the Kentucky Geological Survey, Prof. N. S. Shaler in charge, a few species collected by Mr. F. G. Sanborn, assistant on the survey, the Agricultural Department at Washington, D. C., through Prof. T. Glover, and Mr. Dodge, Mr. T. L. Mead, and W. H. Edwards.

6. A few species in the Museum of the Peabody Academy of Science, Salem, from Michigan, collected by Dr. Clark; collections from Detroit, Mich., made by Mr. Swarz of the Museum of Comparative Zoölogy, Cambridge, and a small collection from Racine, Wis., from Dr. P. R. Hoy.

7. A few species from the Southern Atlantic States, in the Harris cabinet, Boston Society of Natural History.

8. Large collections in the Museum of the Peabody Academy of Science, Salem, Mass., containing my types of new species from Bosque County, Texas, collected by G. W. Belfrage, and from Dallas, Texas, through Mr. Boll. I have also had the privilege of examining the types of a few Texan species, described by Professor Zeller, and contained in the Museum of Comparative Zoölogy. I have also received the larvæ and notes on a few species from Mr. Belfrage.

9. Collections from the Western States and Territories beyond the Mississippi River, made by Lieut. W. L. Carpenter, attached in 1873 to Professor Hayden's Geological Survey of the Territories, and during the same season by Mr. T. L. Mead, and during the summer of 1875 by myself in Colorado and Utah, under the auspices of Professor Hayden's Survey. Collections from Colorado, from Mr. J. Ridings, and the Department of Agriculture at Washington, and in Lawrence, Kans., by Prof. F. H. Snow of the University of Kansas.

10. Very large collections in fine order from the Pacific States, received from Messrs. Henry Edwards and James Behrens, with the collections made in Victoria, Vancouver's Island, and California, by the late Mr. G. R. Crotch, and now contained in the Museum of Comparative Zoölogy, together with a number collected in California by Mr. Alexander Agassiz, and a few received from Mr. Junius Holleman. To all these institutions and gentlemen, as well as to any others who may have been omitted in this enumeration, are due my sincere thanks.

Good collections of European generic types have been received through the kindness of Professor P. C. Zeller and Dr. O. Staudinger. These have been indispensable to me, and saved me some mistakes otherwise unavoidable.

While in France in 1872, M. Guenée most generously threw open his entire collection of this family for my inspection and comparison of specimens, taken with me for the purpose, with his types. I am also indebted to the late Dr. J. E. Gray, and Mr. Frederic Smith of the British Museum, for the privilege of examining Walker's types. The species thus examined with European and other types are indicated in the synonymy thus: !!! Those species recognized by me at sight, but not compared, are indicated by a single mark of exclamation. I have also had drawings made of the remaining types of the late Mr. Walker, with the kind permission of Dr. A. Günther, keeper of the zoölogical department of the British Museum, the work of the artist having been kindly superintended by Mr. A. G. Butler, assistant in the museum. By the liberality of these gentlemen I have been enabled to identify all of Walker's types *now* to be found in the British Museum: for several species, stated by him as being in the national collection, were not to be found. Descriptions of those species of Guenée and Walker, which I have been unable to determine, but which I have seen and regard as good

species, are reprinted, so as to give completeness to the work. I am also indebted to Messrs. A. R. Grote, H. K. Morrison, C. S. Minot, and Dr. L. Harvey for the examination of their types.

The plates illustrating the venation and external anatomy have been drawn by Mr. S. E. Cassino, under my superintendence. The figures in plate I were drawn by myself with the camera lucida; those of the other plates were drawn in the same manner by Mr. Cassino. Most of the figures are exact copies of the camera-drawings; a few have been reduced by photography. By this method it is believed that the drawings are at least approximately correct. In every case I have carefully revised the drawing of the artist. The drawings of the parts of the thorax on plate 7 were drawn by Mr. Cassino with the camera, and then carefully corrected from the specimens; but, after all, these drawings of the thorax must be regarded as partly diagrammatic, as they are quite difficult to represent in outline. The work of Mr. L. Trouvelot, of Cambridge, Mass., who drew the moths, speaks for itself.

While this work is based largely on material contained in the museum of the Peabody Academy of Science, wherein are contained the types of nearly all the new species described by me, I should state that this work has been done as an officer of the Academy; and to the enlightened views of the trustees, who believe that one of the primary objects of the institution is the advancement of science by the publication of original memoirs, I am indebted for the time placed at my disposal in the preparation of this monograph; the funds of the Academy being too limited to warrant the publication of so extended a paper in its memoirs. I also owe much to the kind suggestions and encouragement of Prof. F. V. Hayden, during the preparation and publication of the work.

An essay on the geographical distribution of the *Phalaenidae* of this country, and a list of works referring to the family, will follow the description of the species.

PEABODY ACADEMY OF SCIENCE,

Salem, Mass., Aug. 10, 1875.

A MONOGRAPH

OF

THE PHALENIDÆ OF NORTH AMERICA.

§ 1.—SYNONYMY OF THE FAMILY.

- Geometra* LINNÆ, Syst. Nat., ed. x, 519, 1758.
Phalaena FABR., Ent. Syst., 1793.
Geometra CUVIER, Tableau élément. de l'hist. nat., 1795.
Geometra DUNIS and SCHNEI., Syst. Verz. Wien, Geg., i, 358, 1801.
 " *Phalaenites* LATREILL., Hist. Nat. d. Ins., iii, 411, 1802."—AGASSI, Nomen.
Phalaenites LATR., Gen. Crust. Insect., iv, 226, 1807.
Phalénites LATR., Considerations, 366, 1810.
 " *Phalauides* LEACH, Edinb. Encey., ix, 131, 1815."—AGASSI, Nomen.
Geometra HÜBN., Tentamen, 1-16, or earlier, perhaps 1806 or 1-10.
Geometra HÜBN., Verz., 2-2, 1-1-1.
Phalauida LEACH, in Samouelle's Comp., 252, 1-19.
Phalaenites LATR., Familles Règne An., 477, 1-25.
Geometra TRITTSCHKE, Schin. Eur., vi, 1, 1-27.
Phalaenites DUROCHER., Hist. Nat. Lep., iv, 103, 1-29.
Geometridæ and *Phalauidæ* CURTIS, Brit. Ins., 33, 1-23-100.
Geometridæ STEPHENS, Nomen. Brit. Ins., 43, 1-29.
Geometra BOISD., Gen. et Index, 177, 1-14.
Phalanario ZETTERSTEDT., Ins. Lapponica, vi, 890, 954, 1840.
Geometridæ HERRSCH., Syst. Bearb. Schin. Eur., iii, 1-17.
Geometridæ LIEBERT., Ent. Spinner, Verh. Bot. Zool. Ges. Wien., 172, 1-53.
Phalaenites GRIS., Phal., i, 25, 1-57.
Geometritæ WALK., List Lep. Hct. Br. Mus., xx, 1, 1-69.

§ 2. HISTORY OF THE FAMILY.

In 1758, Linné, in "*Editio decima, reformata*," of his "*Systema Naturæ*," includes all the moths below the genus *Sphinx* in the groups *Phalaena Bombyx*, *Phalaena Noctua*, *Phalaena Geometra*, *Phalaena Pyralis*, *Phalaena Tinea*, and *Phalaena Mucila*. The *Geometre* are divided into *Geometra pectinato* and *Geometra simplicior*.

These divisions are still farther subdivided on the characters afforded by the shape of the hind wings, whether angulated or not. The names of the species with pectinated antennæ end in *aria*, and those with simple

antennae in *ata*. This custom has been followed for the most part by subsequent authors, and is a convenience.

The succession of genera is as follows, adopting modern generic names: *Iodis lactaria*; then follows *Drepana falcataria*, a Bombycid moth; *Urapteryx sambucaria*; *Drepana lacertinaria*, also a Bombycid; *Eugonia alniaria*, and allied forms ending with the European *Geometra papilionaria*. The *Seticornes* begin with *Nemoria viridata* and end with *Cheimatobia brumata*. This division includes some Pylalids, and it will be seen that the arrangement is essentially an artificial one, except that on the whole the disposition of species agrees with present classifications; those comprised in the *Urapteryx* and *Eunomia* standing above the *Geometrina*.

In 1793, Fabricius, in the "*Entomologica Systematica*," simply followed Linnaeus in dividing the genus *Phalæna* into two sections: 1. *Antennis pectinatis*; 2. *Antennis scaccis*. His first division begins with *Iodis latearia*, and the second division includes besides the Phalænids with simple antennæ, the *Platyptericina*, and the Deltoid moths. It will be seen that he simply follows the arrangement of Linnaeus.

In 1801, Denis and Schiffermüller, in their celebrated work "*Systematisches Verzeichniss von den Schmetterlingen der Wiener Gegend*," made the following arrangement of the *Phalænida*, based on the larval characters.

The group termed *Geometra*, Linn. (*Phalæna*, Fabr.), is divided into the following subdivisions:

I. *Larvæ pedibus duodecim*, subdivision A beginning with *Metrocampta margaritaria*.

II. *Larvæ pedibus decem*, subdivisions A to P, group A beginning with *Geometra papilionaria* and ending with *Acidalia ornata*, group P beginning with *Petrophora dotata*.

Much fault may be found with this arrangement, but it is the first attempt to give a natural arrangement founded on the larval stages. The divisions I and II are unnatural ones, as in the genus *Anisopteryx* we have one species (*A. pomelaria*) hitherto regarded as being scarcely more than a variety, which has rudiments of a third pair of abdominal feet, and the other (*A. cornuta*) entirely without such rudimentary appendages. The same group P, besides several species of *Petrophora* and *Acidalia*, respectively, contains *Pellonia ribicaria*.

In 1807 Latreille (*Genera Crustaceorum et Insectorum*, iv), under the

family-name *Phalanites* (which I translate into *Phalanida*), briefly classifies the species of *Phalana*, proposing no new generic division, but states that from the larval characters the family should be divided into three genera. The first is *Platypteryx*, Laspeyres (= *Diapana*, Schrank); the other two groups (II. *Eraca pedibus duodecim*; III. *Eraca pedibus decem*) corresponds to the true *Phalanida*. The second (unnamed) genus comprises the modern genera *Metrocampta* and *Ellopia*; and the third (unnamed) genus, subdivided into five sections) begins with *Crypteryx sambucaria* and ends with *Hybernina detoliaria*; the genera between are arranged with little regard to the natural system, and in this respect the arrangement is inferior to that of Linnaeus.

In 1810 (Considerations), he followed the same arrangement.

In 1815, Leach, in the Edinburgh Encyclopedia, proposed the name *Phalanides* for the family, according to Agassiz's "*Nomenclator*;" but I have not seen his arrangement of the genera.

Previous to the year 1816, Hübner published on a single sheet his "*Tentamen*." There is no date on it. To Mr. Seudder we are indebted for calling attention to this publication. Says Mr. Seudder, "It is twice referred to by Hübner himself; once in the preface to his *Verzeichniss*, written in 1816; and again, in 1818, in the preface to the first century of his *Zutrage*." The part relating to the Phalanids is here reprinted.

PHALANX V.—GEOMETRÆ.

Tribus I: ataphæ.

- I. Hyleræ—Hyleræ Fasciaria.
- II. Terpine—Terpine Papilionaria.
- III. Eusarcæ—Eusarcæ Elinguaria.
- IV. Lares—Lars Sambucaria.
- V. Eutrapelæ—Eutrapelæ Lunaria.
- VI. Erastriæ—Erastria Amataria.

Tribus II: tentus.

- I. Cyclophoræ—Cyclophora Pendularia.
- II. Spilotæ—Spilote Grossulariata.
- III. Sphecodes—Sphecodes Pusaria.
- IV. Chlenastæ—Chlenastes Philaria.
- V. Sciadiæ—Sciadion Funaria.
- VI. Cymatophoræ—Cymatophora Roboraria.

Tribe III: acyroce.

- I. Pachyes—Pachys Prodromaria.
- II. Epirrita—Epirrita Dilutata.
- III. Rheumaptere—Rheumaptera Hastata.
- IV. Hydria—Hydria Undulata.
- V. Petrophore—Petrophora Maniata.

There is no good reason why these names should not stand, as observed by Dr. L. Harvey as well as by Mr. Scudder,* who called the attention of entomologists to this neglected publication.

In 1818, Hübner† published the part of the “*Verzeichniss*” relating to the *Phalaenida*, which are grouped under the name *Geometra*, forming his “*Phalaenx quinta*.” He divides the group into three tribes, the tribes into stirps, and the latter into families, genera, and species.

Tribe I, stirps i–ii comprises the modern *Geometrinae*; stirps iii, part of Guenée’s *Ennomidae*; stirps iv contains the *Uranides*, and a part of the *Ennomina*; stirps v comprises the *Fidoniina*, some *Ennomina*, and *Semiothisa*; stirps vi comprises, among other genera, *Lythria*, *Hematopsis* and *Calothysanis*.

Tribe II, stirps i contains, among other genera, *Codonia*; stirps ii, *Orthostixis*, *Rhyparia*, *Panthera*, *Baptia*, etc.; stirps iii comprises certain *Acidulina* and the *Caberina*; stirps iv comprises the Hübnerian genera *Scolopteryx*, *Catascia*, *Ascotis*, *Dyscia*, etc.; stirps v comprises *Cymatophora*, or Guenée’s *Boarmidae*.

Tribe III, stirps i comprises the modern genera *Amphidasys*, *Biston*, *Phigalia*, *Nyssia*, etc.; stirps ii contains *Operophtera*, *Oporinia*, *Hydriomena*, *Trichopteryx*, the groups represented by *Eupithecia*, etc.; stirps iii includes, among other genera, *Melanippe*; stirps iv comprise *Calocalpe*, *Pterocymia*, etc., and *Glaucopteryx*; stirps v, and last, *Ochyria*, *Lygris*, *Carsia*, *Lithostege*, etc.

From this arrangement it will be seen that Hübner placed the *Geometrina* above even *Urania* and the *Ennomidae* of Guenée, while his third tribe is a mixture of certain of Guenée’s *Boarmidae* with the *Larentidae*. Here

* Bulletin Buffalo Soc. Nat. Sci., March, 1874.

† I accept Mr. Scudder’s discovery that “page 74 of the *Verzeichniss*, or, in other words, its fifth signature, and all following it, could not have been printed before two years after the *Verzeichniss* is dated.” Historical Sketch of the Generic Names proposed for Butterflies. Proceed. Amer. Acad., 2 (ii), 1878, p. 97.

again, *Glucopteryx* is placed above *Carsia* and *Lithostegia*, though evidently lower than the latter two genera.

The great merit of Hübner's classification is his recognition of many subdivisions of the families (in Latreille's sense) of the Lepidoptera, and the subdivision into groups which correspond to modern ideas of a genus. I have found it necessary to set aside many modern genera, and adopt Hübner's names for them as fairly entitled to recognition.

In 1819, Samouelle, in the "Entomologists' Useful Compendium," gave the following arrangement: *Phalaenida*, stirps i. larva with twelve feet, *Phalaena margaritaria*; stirps ii. larva with ten feet, *Hipparchus*, *Papilio*, *Geometra*, *Ourapteryx*, *Biston*, *Abraxas*.

In 1825, Latreille, in his "*Familles Naturelles*," left out of his *Phalanites*, which he regards as simply a tribe of his family *Nocturna*, embracing all the moths below the Sphinges, the *Platyptericinae*, and followed the same arrangement of the true *Phalaenida* as he proposed in 1807.

The *Phalanites* are strangely placed between the *Tortricæ*, comprising the modern Deltoids (in part) and Pyralids (in part) and *Crambites*.

Latreille's arrangement as regards the succession of genera is certainly much inferior to that of Linnaeus, and his conceptions of the families of the Lepidoptera much less carefully elaborated than in other orders of insects. In the "*Familles Naturelles*" he retrogrades in his views regarding a family, as applied to the Lepidoptera, as since 1807 he considers the *Phalanites* as forming the "*Familia octava*" of the Lepidoptera.

In 1827, Treitschke, in the continuation of Oechsenheimer's "*Schmetterlinge von Europa*," uses the term *Geometra* for the group, and makes no subdivisions above genera. He begins the description of the genera with *Eumomus*, and the remaining genera follow on, thus: *Acron* (*Uropteryx*), *Ellopius*, *Geometra*, *Aspilates*, *Crocallis*, *Euophus*, *Boarmia*, *Amphidasys*, *Psodus*, *Polonia*, *Chesius*, *Cabera*.

In 1829, Duponchel, in the "*Histoire Naturelle des Lépidoptères de France*," IV, proposed the following division of the *Phalaenida* into forty-eight genera:

- I. Chenilles à quatorze pattes—*Rumia*.
- II. Chenilles à douze pattes—*Metrocampa*.
- III. Chenilles à dix pattes—*Eumomus*, *Hemera*, *Crocallis*, *Angerona*, *Eurygona*, *Arctia*, *Philobia*, *Epania*, *Tremandra*, *Hemitea*, *Geometra*, *Am-*

phidasis, *Nyssia*, *Phigalia*, *Hibernia*, *Boarmia*, *Halua*, *Fidonia*, *Ligia*, *Numeria*, *Cabera*, *Ephya*, *Dosithia*, *Acidalia*, *Aspilates*, *Pellonia*, *Cleogene*, *Phasius*, *Nabolia*, *Ourapteryx*, *Gnophos*, *Venilia*, *Zerene*, *Corycia*, *Melanthia*, *Melanippe*, *Cidaria*, *Anaitis*, *Larentia*, *Amathia*, *Chesias*, *Strenia*, *Tanagra*, *Psodos*, *Siona*, *Minoa*.

It will be seen that the arrangement, based on the larval stages, is an artificial one, and open to the same objection as that of Denis and Schiffermüller. It begins with the *Ennominae* (in part); *Geometra* is placed above *Hibernia* and *Boarmia*; *Acidalia* and *Aspilates* are brought together; and *Ura-apteryx* succeeds all these, while *Gnophos* is widely separated from *Boarmia*. The *Larentinae* come last and lowest, with the exception of *Tanagra* (*Bapta*), *Siona*, and *Minoa* and *Cidaria*, which should really precede the genus *Larentia* (*Glaucopteryx*, *Petrophora*). Duponchel includes the Noctuid genus *Ligia* in the family, placing it between *Fidonia* and *Numeria*.

In the same year, Stephens published "The Nomenclature of British Insects", a simple list with many new genera. He proposes the term *Geometridæ* for the family, but does not attempt a subdivision of it.

The succession of genera is here given. A few new genera are indicated (n. g.), but not named. *Psychophora*, *Speranza*, *Fidonia*, *Bupalus*, *Anisopteryx*, *Lamptia*, *Amphidasis*, *Biston*, *Metra*, *Crocallis*, n. g. (*Ennomos bidentata*), *Geometra*, *Pericallia*, n. g. (*Hipparchus Prunaria*), n. g. (*Ennomos crataegata*), *Ourapteryx*, *Phalena*, *Ellopiia*, *Hipparchus*, *Cleora*, *Alcis*, *Hemiphrila*, *Boarmia*, *Grammatophora*, *Azincophora*, *Cabera*, *Cyclophora*, *Bradypetes*, *Aspilates*, *Larentia*, *Cidaria*, *Harpalyce*, *Steganolophia*, *Electra*, *Idia*, *Abraxas*, n. g. (*Xerene melanaria*), *Xerene*, *Ypsipetes*, *Phibalapteryx*, *Scotosia*, *Triphosa*, n. g. (*Acidalia bilineata*), n. g. (*Acidalia undulata*), *Charissa*, *Pachygenemia*, *Lozogramma*, *Aplocera*, *Chesias*, n. g. (*Chesias simulata*), n. g. *Acidalia dilutata*, *Cheimatobia*, *Lobophora*, *Eupithecia*, *Minoa*, *Baptia*, *Emmelsia*, *Hercyna*, *Hyria*, *Ptychopoda*, *Macaria*, *Ennomos*.

The arrangement is very objectionable, beginning with *Psychophora*, *Speranza* and *Fidonia*, and ending with *Macaria* and *Ennomos*; *Cidaria*, *Harpalyce*, *Electra*, and *Eupithecia* preceding *Macaria*. The merit of the work is in the proposal of desirable new genera, though in this he and Duponchel, as well as Curtis and Treitschke, have ignored Hübner. Whether Stephens's work appeared before Duponchel's fourth volume or not is not known. Duponchel's names should, of course, have priority, since the descriptions and

figures are given; and the work must have been prepared before that of Stephens, as it is a part of an extended work.

In 1831, Stephens, in his "Illustrations," proposed several new genera.

In 1840, Boisduval, in the "*Genera et Index Methodus Europæum Lepidopterorum*," enumerates fifty-nine genera under the head *Geometra*, proposing a few new ones himself. No subdivisions of the *Geometra* are proposed. The group begins with *Heliotheca* and *Chogone*; then follows *Geometra*, and its allies *Heterocampa*, *Urapteryx*, etc. A part of the modern *Larentiine* come before *Ephyra* and *Acidalia*, while at the end are placed *Siona*, *Sthandelia*, *Odezia*, *Torula*, *Psodos*, *Pugmana*, *Anthomatra*, and lastly *Minoa*. It will be seen that the arrangement has little merit.

In 1847, Herrich-Schäffler proposed a new classification of the family in his "*Systematische Bearbeitung der Schmetterlinge von Europa*." He divides it, under the name *Geometrides*, into two divisions:

I. *Phytometrides*.

II. *Dendrometrides*.

The latter comprises *Anisopteryx*, *Lythria*, *Sterrhæa*, *Minoa*, *Hydrelia*, *Eupithecia*, *Larentia*, *Chimotobia*, and *Chesias*. All the remaining genera, of which there are fifty-two, are included in the *Phytometrides*.

The arrangement of these genera is not satisfactory, and many well-defined genera are regarded as subgenera by the author. It is needless to remark that the division into *Phytometrides* and *Dendrometrides* is essentially artificial.

In 1850, Stephens's "List" of the Lepidoptera in the British Museum appeared. It is a new list, but notable from his adoption of Hübner's genera. He divides the family into nineteen subfamilies. The arrangement of the genera is quite unnatural.

In 1853 appeared Lederer's "*Versuch die europäischen Spinner*." This was by far the most carefully prepared work that had hitherto appeared on the European species of this family. The genera are carefully described, especial stress being laid on characters drawn from the venation. A number of new genera are proposed, some of which, however, I have felt obliged to set aside on account of their having, in my judgment, been pre-occupied by Hübner's names. He divides the family into four groups, without naming them.

Group I comprises the *Geometridæ* of Guenée. Group II is my *Acadulina*. Group III comprises the *Eumomida*, *Amphidulida*, *Boarmida*, *Cabe-*

rida, *Macarida*, *Falonida*, *Zeremida*, and *Hibernida* of Guenée. Group IV is nearly equivalent to Guenée's *Larentida*, except that *Lythria* is contained in it, and it also embraces *Cheimatobia*, and ends with *Eupithecia*.

While there are many good features in this classification, and the genera are carefully described, I can see no good reason for placing the *Geometrae* higher than the *Ennominae*, or for placing his second group above the third.

The last important work is the excellent general treatise on this family by A. Guenée. It appeared in 1857. It is the most useful work that has appeared, and it is of special value to entomologists in this country from the large number of American species described in it. The generic characters are given with considerable fullness, and the characters drawn from the larva and pupæ are valuable as being the first attempt to use them in conjunction with the imaginal characters.

M. Guenée's classification is as follows: He divides the family *Uranides*, which he regards as a group equivalent to the *Noctuidæ* or *Phalænida*, into the following families:

- I. *Cyrtimonida*.
- II. *Uranida*.
- III. *Nyctalemonida*.
- IV. *Sematurida*.

The *Phalænites* of the globe are subdivided into twenty-six families, as follows: *Uapterygida*, *Ennomida*, *Oenochromida*, *Amphidasysida*, *Boarmida*, *Boletobida*, *Geometrida*, *Micoverida*, *Palyada*, *Ephyrida*, *Arctalida*, *Micronida*, *Caberida*, *Macarida*, *Falonida*, *Hazida*, *Zeremida*, *Ligida*, *Hybernida*, *Larentida*, *Eubolida*, *Sionida*, *Hedylida*, *Eratiniida*, *Emplocida*, *Hypochrosida*.

While I would not regard these groups as of sufficient importance to be considered as families; in the succession of the genera, and the recognition of the groups to which the learned author applies family names, I cannot but regard this as the best classification hitherto presented, while it is the most elaborate work on the family that we have. It must always remain a classic.

It will be seen that I have in the main followed M. Guenée's arrangement of genera. It should be borne in mind that my arrangement is based mainly on a study of North American species, with the aid of European types, while Guenée's work includes species from the tropics of both hemispheres and Australia, as well as China, and, in fact, the globe. Whether the changes

proposed in the following classification will stand, remains to be determined by any one who may undertake to elaborate the Phalaenid fauna of the world. I have ventured only after careful observation of anatomical facts to unite some of M. Guenée's families into larger groups, which may provisionally be regarded as subfamilies. All through my work, the elaborate monograph of M. Guenée has been my chief guide. The students of moths are under greater obligations to him than any other author. Next to his work I rank Lederer's, which has been also of much use to me.

Walker's "Lists of the Lepidoptera Heterocera in the British Museum" simply follow Guenée's classification. A great opportunity was lost by the authorities of the British Museum in the publication of a series of meagre descriptions which have only brought maledictions on the head of the amiable but uncritical author of the Catalogues. I have endeavored to do full justice to the work, as stated in the introduction.

§ 3.—DIFFERENTIAL CHARACTERS OF THE FAMILY.

Body slight, long, and slender. Thorax rather small and weak, never tufted or crested. Head small, quite free from the thorax, either moderately long or very short. Compound eyes rather large, full, and spherical; simple eyes, two in number, often wanting. Front of the head rather narrow, usually decreasing in width toward the anterior edge, full and bulging, rarely flattened, often with an acute, dense tuft projecting between the base of the palpi. The clypeus is nearly square, forming nearly the whole front of the head; the antennae being inserted high up on the vertex; it is smooth; in only one genus (*Phidonia*), so far as known to me, with a denticulated, median, compressed tubercle; the epicranium is very small and short, often only half as long as wide; while the occiput is a narrow, transverse piece, not quite so long as the epicranium. Vertex not tufted, or with a low, flat, inconspicuous crest.

Antennae either simple, with minute, fine cilia; more often with large, dense cilia, sometimes like fine bristles; or they are pectinated; the branches short, spatulate, and ciliated, or, more usually, well developed, sometimes long and slender; the antennae sometimes plumose, but a single pair of branches to a joint; the pectinations often wanting on the outer third or fourth of the antennae. Palpi slender, porrect, nearly always passing beyond the front; the second joint much longer than the others, moderately broad, usually passing

beyond the front; third joint usually rather short, conical, often partly indistinguishable from the second on account of the projecting hairs of the latter.

The wings are large compared with the slight, feeble body. The fore wings are triangular, the outer edge being nearly, sometimes quite, as long as the inner edge; apex often acute, subfalcate, or markedly falcate; inner angle distinct; costal edge straight, or considerably curved or sinuous. Hind wings, with the inner edge long and straight, longer than the outer, the latter full and rounded, often angular, sometimes remarkably so. Venation: usually six subcostal venules; always but three median venules; no submedian vein, sometimes a fold representing it. A subcostal cell often present, sometimes two; the cell being formed, almost invariably, by the anastomosis of the first subcostal venule with its vein. Independent vein well marked; usually in the middle of the discal space.

The legs are always long and slender; in only one genus (*Lithostegæ*) are the short and stout fore tibiae armed with a heavy, acute spine. The hind legs are long and slender; the hind tibiae nearly always long and slender, often swollen, with two pairs of slightly unequal, long, slender spurs; sometimes there is but one pair, very rarely none at all. Occasionally the hind tibiae have a long tuft of hairs (scales) appressed to the joint. Hind tarsi usually long and slender, often a little longer than the tibiae; sometimes (as in *Acidalia* and a few other genera) they are not more than half as long as the tibiae.

Abdomen long and slender, usually with a well-marked tuft of hairs at the end; sometimes with lateral and dorsal slight tufts, and dorsal spots or lateral lines.

The genital armature is large and well developed, but varying greatly in the different genera. The supra-anal plate is more or less triangular, varying much in size; the recurved spine is usually long and recurved; the lateral claspers are usually broad, spatulate, and simple.

Larva slender, with usually but two pairs of abdominal legs, rarely three or four pairs, so that it has a looping gait. The larvae live free, except in certain species of *Eupithecia*, which bore in seeds. Pupa slender, often green or variegated in color, inclosed in a slight, silken cocoon or subterranean cell.

§ 4.—COMPARATIVE ANATOMY OF THE HEAD.

The head in the imago of the Lepidoptera consists of three pieces: first, the basal or occiput; second, an intermediate piece, the epicranium; and

third, the clypeus. The relation of these parts is remarkably constant in all the Lepidoptera. In the Bombycidae there is a great variation in all the groups; but in the Noctuidae they are very constant. The relative proportion of these pieces is very constant in the Phalaenidae, so much so that they are seldom of much practical use as generic characters.

The *occiput*, or base of the head, on the vertex, is separated by suture from the orbits. It is usually very short (antero posteriorly) in the median line of the head, widening out where it touches the orbits.

The *epicranium* is very small and narrow, often not extending on either side to the orbits. It is contracted in front, extending between the insertion of the antennae, and is moderately convex.

The *clypeus* occupies nearly the entire front of the head, and is so large as to carry the insertion of the antennae well up on the vertex. It is usually considerably longer than broad, especially in many of the higher genera; while in *Eupithecia* it is shorter; so, also, in *Bourmia*. The sides are often parallel, and often also converge a little anteriorly; the base is deeply sinuous, being excavated on each side to receive the antennae.

How these pieces vary in several of the typical genera may be seen from the following notes and figures, beginning with the lower genera and ascending to the higher:

Eupithecia miserulata (pl. 6, fig. 19).—In this species, the occiput is longer than usual, and as long in the middle as on the sides, being transversely oblong. The epicranium is equilaterally triangular, though a little shorter than broad. The clypeus is considerably longer than broad, the sides slightly converging. It is rather full on the surface.

Petrophora diversilincata.—Head much narrower than in the higher sub-families. Eyes full and globose; both the occipital and clypeal regions more elongated than usual. Occiput long, being one-fourth as long as wide, and of even length throughout, but near the orbits extending anteriorly in a slight point. Epicranium rather small; subtriangular; hinder edge a little more convex than usual. Antennae moderately far apart. Clypeus nearly square, a little longer than broad; sides straight and parallel. No orbital region; front of clypeus well rounded, convex; mandibles well developed; labrum minute; and tongue well developed as usual.

Hydria undulata.—In some respects a mean between *Petrophora* and *Phibalapteryx*. Eyes less full. Occipital region not so wide as in *Petrophora*;

occiput a little more than a third as long as wide; epicranium somewhat short lozenge-shaped; same distance between antennae as in *Petrophora*. Clypeus, however, shorter, hardly as long as wide, and very slightly converging anteriorly, and not so much rounded on the front edge as in *Petrophora*. Mandibles, tongue, etc., same as *Petrophora*.

Melanippe.—Front long and very narrow; occipital region widening considerably. Eyes a little larger than in *Petrophora*; occiput one-third as long as broad, and not hollowed out by the epicranium, which is small, flattened lozenge-shaped. A little narrower between the antennae than usual. Clypeus remarkably long, taking up whole front; on upper side of clypeus, orbital region slightly developed. Front edge like clypeus of *Petrophora*, being well rounded; and mandibles and tongue as in *Petrophora*.

Phibalapteryx intestinata.—Front shorter, clypeal region more triangular, and occipital widening more than in *Petrophora*. Occiput a little smaller than in *Petrophora*, being shorter; but the epicranium is of the same form, only larger. Clypeus of about the same form, but the sides converge more anteriorly. Front edge much less rounded. Mandibles and tongue the same.

Caripeta divisa, ♂ (pl. 6, fig. 20).—Occiput moderately long; excavated in front to receive the epicranium, which is subtriangular, and nearly as long as broad. Clypeus moderately full, oblong, much longer than broad; sides converging very slightly anteriorly. Two ocelli present.

Fidonia truncataria.—The front is very broad, the eyes being smaller than in the higher genera. Occipital region just as long as clypeus. Occiput very short, forming a slightly marked ridge of even width throughout. Epicranium large, moderately convex, hind edge moderately curved, broad between the antennae. Clypeus very broad, square; very slightly shorter than broad; free from orbits; quite a wide region between the clypeus and eyes. Tongue as large as usual; mandibles and labrum minute, the former very slender. In this and the next species the tegument is mahogany brown.

Fidonia notataria.—Differs from *F. truncataria* in having the occiput blended with the epicranium, and a little longer; the epicranium is a little smaller; clypeus the same, but orbital region much narrower. Eyes a little fuller, and appearing proportionally larger. So that there are sometimes specific differences in the proportions of the head. Compared with the generic characters, they are slight, varying most on the occipital and orbital regions.

Perconia finctaria, ♂ and ♀.—The structure of the head is very remark-

able, especially as the head of the European *P. fasciolayia* is nearly normal, having no crest on the clypeus. In both species, however, the occiput is moderately long, but not as usual excavated in front; on the contrary, the front edge is remarkably straight, the piece not dilating on the side. The epicranium in *P. fuscicornia* is raised above the surface of the head; it is trapezoidal in outline, two-thirds as wide in front as behind, the anterior edge forming a thin projecting crest overhanging the base of the clypeus. This latter piece is not separated as usual by a well defined suture from the orbits. The middle area is much raised, oblong, bound by a high, thin crest; the lateral crests denticulated. Along the middle of the oblong inclosure runs a high, rounded denticulated crest. There are no ocelli.

Zerene catenaria.—Resembles closely *Fidonia*. The front is very broad, and widens more on the occiput than in *Fidonia*. Occiput forming a wider ridge than in *Fidonia*; encroached upon in the middle by the epicranium, but widening on the side rapidly. Epicranium small, subtrapezoidal, not reaching the occipital region; moderately convex, and hinder edge moderately rounded. Antennae much nearer together than in *Fidonia*. Clypeus trapezoidal; sides narrowing in front. No longer than broad; surface moderately convex; tongue rather long, and of the usual size; occipital region rather wide; clypeus rounded in front. Labrum as usual; mandibles minute, slender, not overlapping the tongue. Tegument dark mahogany brown. Eyes a little larger proportionally than in *Fidonia*.

Eufitchia ribearia.—Occipital region widening moderately; occiput very large, about one-third as long as wide; of the same length throughout, on the sides as in the middle. Epicranium small, subtriangular; inter-antennal space rather narrow; the epicranium divided into two parts by a ridge just opposite the hind edge of the antennae. Clypeus square, a little longer than broad. The clypeal region narrows a little anteriorly. Eyes large and globular; tongue long and well developed; mandibles long, slender, partially overlapping the tongue; labrum as usual.

Pantherodes pardalaria.—This Brazilian species closely resembles *Eufitchia*; the clypeus of *Pantherodes* is a little longer and flatter, and the epicranium is a little fuller, but the relative size of the three pieces are the same.

Acidalia lineata (pl. 6, fig. 24).—Front rather narrow, widely diverging on the occipital region, with large full globose eyes rising considerably above

the surface of the front. The occipital region is considerably shorter than the clypeal; the occiput being short in the middle, and dilated on the side. The epieranium is rather small, subtriangular; the hind edge being moderately rounded and encroaching on the occiput. Clypeus squarish; considerably longer than broad, the sides narrowing considerably in front, and with no orbital region; surface moderately convex. Mandibles long, slender; labrum minute; tongue well developed. Two ocelli present.

Eucrostis chloroleucaria, ♂ (pl. 6, fig. 22).—Head remarkably broad on the vertex; occiput remarkably short, dilating on the sides. Epieranium very large, transversely diamond-shaped, extending much farther back than usual, with two tubercles in the middle. The clypeal region flat and very broad at base, narrowing rapidly in front, more so than in any genus of the family thus far examined. The ocelli are very small, partially obsolete.

Tephrosia canadaria.—This genus is allied to *Acidalia* and *Petrophora* in the form of the head, the clypeus being long and narrow. Occipital region long; eyes full and globular; epieranium small and subtriangular.

Cymatophora crepuscularia (pl. 6, fig. 23).—Head short and broad. Occiput moderately long, excavated by the epieranium, which is narrow, small, rounded, and very convex. Clypeus nearly square, only slightly longer than broad, the sides slightly converging anteriorly.

Ennomos magnaria.—The head resembles *Eurymene* in its general shape, size of the eyes, breadth, and form of the clypeal region (*i. e.*, region between the eyes). The occiput is larger than usual, being very long, and not much wider at the end than in the middle, since the epieranium is small and does not encroach as usual on it. Epieranium small, globose; very convex behind each side; not reaching so near the orbits as usual; the interantennal space being rather wider than usual. Clypeus large and broad; not so free from the orbits as usual; very wide; not much longer than wide; front edge rounded. Labrum small; broadly triangular. Mandibles small; almost obsolete. Maxillæ small, weak; one-third as long as in *Caberodes*. By the cephalic characters, this is a lower genus, evidently, than most of the *Ennomine*, and should follow on after *Eurymene*.

Angerona crocatoria.—Occipital region full, and very convex; wider than in *Caberodes*, the eyes being flatter and smaller. Occiput very short, especially in the middle, where it is very narrow, forming a slight ridge, but expands triangularly between the epieranium and orbits; the epieranium

being unusually full convex, encroaching on the occiput, and broad between the antennal sockets. Clypeus full, much longer than broad, convex, and distinct from the orbits; longer than in *Caberoles*; the front edge is rather narrow, and rounded in front. Tongue weaker and slenderer than in the higher genera. Mandibles rather slenderer.

Eucyanea unitaria.—In this genus the front is wider than in *Caberoles*, *Eutrapela*, or *Tetraxis*. The occipital region (*i. e.*, the occiput and epicranium together) is nearly as long as the clypeus; the epicranium is long, uniformly so, forming a transverse band as wide at the middle as the ends. The epicranium is squarish; hind edge but slightly convex; a median central depression; antennae inserted wide apart. Clypeus squarish, being but little longer than broad; the sides narrow a little anteriorly, the orbits much more; the posterior and anterior edges are both much rounded, and the surface is very convex, as much so as in *Caberoles*. The head grows wider on the occipital region than in *Eutrapela* or *Caberoles*, and the eyes are smaller and flatter, the clypeal region being wider.

Tetraxis crocaltata.—Occipital region larger than in *Eutrapela* and *Caberoles*; the epicranium being longer, and projecting more broadly between the sockets of the antennae and the eyes. Epicranium transversely oval, somewhat approaching that of *Eutrapela* in form; both pieces moderately convex. Antennae as wide apart as in *Eutrapela*. Clypeus in form like *Caberoles*, but a little less convex, though much more so than in *Eutrapela*, and a little more trapezoidal than in *Caberoles*. Mandibles and labrum as usual. Maxillae large. The whole head is smaller, and the eyes decidedly smaller, than in *Caberoles*.

Caberoles metrocampa.—The occipital region is large, but the occiput is smaller than in *Eutrapela*, being shorter, while the epicranium is considerably larger than in *Eutrapela*, and does not form a lozenge, the hind edge being very convex. Surface very full and convex, much more so between the antennae than in *Eutrapela*, the space between them being wider. The clypeus is subtrapezoidal, the sides narrowing a little anteriorly, and the surface is very convex, much more so than in *Caberoles*, rising up flush with the eyes; it is considerably longer than broad. Thus, *Eutrapela* is much nearer to *Cydonia Leilus* than *Caberoles* is; in the latter, the head growing wider between the eyes.

Endropia hypochrysa.—Head slightly smaller than in *Caberoles*, to which

it is closely allied; the occipital region widens more posteriorly. Occiput and epieranium as in *Caberodes*, but the epieranium is flatter. Clypeus longer and less convex than in *Caberodes*; full and bulging over the front edge, which is quite thin. Mandibles, maxillæ, and labrum as in *Caberodes*; labrum a little longer and more pointed, however. The whole head is not so wide and is higher than in *Caberodes*.

Eutropia bilinearia.—Head intermediate between *Eutrapela* and *Caberodes*, the occiput widening, but the clypeus is square, much as in *Eutrapela*. Occiput very short, in the middle encroached upon by the epieranium, being very short, forming a simple ridge. Epieranium of the form of *Caberodes*, not so wide between the antennæ. Clypeus almost square, subtrapezoidal, but flat, as in *Eutrapela*, and much less narrowed in front than *Caberodes*. Maxillæ large and well developed. Mandibles smaller than in *Caberodes*.

Eutrapia transversata (pl. 6, fig. 24).—The occipital region is much broader than in *Cydimon*, the occiput being rather long antero-posteriorly, while the epieranium is large, being lozenge-shaped transversely, full and convex, almost bullate, and surmounted by two tubercles. The size of the occipital region forces the insertion of the antennæ down the front. Clypeus nearly square, being but little longer than broad, with parallel sides; its surface is quite full, convex, and a little sunken below the eyes. Mandibles, maxillæ, and labrum as described in *Cydimon*.

Cydimon Leilus (pl. 6, fig. 25).—The occiput and epieranium are small and narrow, the antennæ being inserted on the summit of the head; the epieranium is very small, the basal joints of the antennæ being large and near together. The clypeus occupies the entire front, being much longer than broad, narrow, the sides parallel, not narrowing in front, and the surface flush with the eyes. The front edge is slightly arcuate, being slightly produced in the middle of the edge, with the lateral foramina distinct. Mandibles rather long, incurved, and with the usual dense, golden setæ lying over the base of the maxillæ. Labrum small, narrow. Maxillæ well developed.

As the *Uranides* do not belong to the fauna of the United States, they will not be treated of further in this work. I will only say that on account of the structure of the head I cannot at present agree with Guenée in regarding them as a distinct family. The venation is also much as in the *Phalenidae*, there being only three median venules. On this account, I regard them as

forming the highest subfamily of the *Phalaenidae*. I am aware that the larvae have sixteen feet, no other Phalaenid having more than fourteen.

Eyes.—There are no peculiarities in the eyes sufficiently marked to distinguish the genera and species. They are full, spherical, dotted with black spots, and provided with scattered, short, minute hairs.

Ocelli.—Although it is stated* that the *Phalaenidae* have no ocelli, I have found that they generally occur in our species: though, compared with those of the *Noctuidae*, they are small and easily overlooked. They are situated very near the eyes, usually on the suture between the epicranium and occiput. They sometimes appear as if actually situated on the occiput, but this is not the case, as their normal site is the posterior edge of the epicranium.

They are present or absent in different species of the same genus. For example, in *Semiothisa quadri-signata* they are unusually large and distinct; while, in *S. ocellinata*, they are entirely absent. It is a question whether they are ever of use to the insect, as, in most cases, they appear as if partially aborted, and their presence and absence in different species of the same genus shows that they are not very essential to the life of the insect.

They occur in various degrees of perfection in the following species: *Glaucopteryx caesiata*, *Plumyria flariata*, *Hydriomena trifasciata*, *Oclepria designata*, *Melanippe ruficollata* and *bastata*, *Phibalapteryx intestinata*, *Eucornia undulata*, *Bapta alborittata*, *Heterophleps triguttata*, *Zerene calenaria*, *Semiothisa quadri-signata*, *Azelina hubneraria*, *Tiphrosia canularia*, *Metrocamptoparia*, *Caripeta divisata*, *Acidalia quadricellata*, *Eucrostis chlorobucaria*, *Metanema inatomaria*, *Endropia hypochraria*, *Caberoles confusaria* and *metrocamparia*, *Entropia transversata*, *Cydlimon Loileis*.

The following species were found to have no ocelli: *Eupithia miserulata*, *Petrophora prunata* and *P. diversilincata*, *Oporinia perlineata*, *Semiothisa ocellinata*, *Anisopteryx pomataria*, *Cymatophora crepuscularia*, *Nematocampy filamentaria*.

§ 5. COMPARATIVE ANATOMY OF THE THORAX.

In studying the anatomy of the thorax of the *Phalaenidae*, as compared with that of other families of the Lepidoptera, we are baffled by the want of a comparative knowledge of the parts of the thorax in this and other orders of insects. It is the writer's intention to prepare a work on the comparative external anatomy of insects, and he has collected some materials for the pur-

*A. G. Rehn. *Phalantes*.

pose in the Lepidoptera, Hymenoptera, as well as the Hemiptera, Orthoptera, and Neuroptera. Hitherto the pieces composing each of the thoracic rings have been used with the greatest success in the Coleoptera by Dr. J. L. Le Conte, in his works on North American Coleoptera.*

Various hymenopterists have found the thoracic characters very useful in classification.

In the Lepidoptera the writer† has found that good family characters exist in the relative size and proportion of parts in the thorax as well as the head.

The *Zyganidae* and *Noctuidae*‡ have been found to differ in apparently reliable thoracic characters. The *Phalaenidae* also differ from the other lepidopterous families in the form of the thorax. In order to bring out these differences, I have on plate 7 represented the dorsal and lateral aspect of the thorax in a typical species of each lepidopterous family, so that the eye may at once seize upon the differential characters without long verbal descriptions.

The terminology of parts is as given in my "Guide to the Study of Insects", which was adopted from the works of Andouin§ in connection with those of Fabricius, Kirby and Spence, Burmeister, Newport, and others. Without at this time revising the nomenclature of the external anatomy of the thorax of Lepidoptera, further than I have done in my "Guide to the Study of Insects", which could not be accomplished without extended study of all the other orders of insects, I will briefly call attention to the most apparent differences between the families of Lepidoptera, beginning with the lowest. The terminology is given in the explanation of the plates.

Pterophoridae (*Pterophorus marginiductylus* Fitch, pl. 7, fig. 9, 9a) Tergum.—There is a greater equality in the size of the meso- and meta-thorax than usual in the other families, unless we except the *Hepiali* among the *Bombycidae*. The mesoscutum is very small, squarish; mesoscutellum very large and long, the sides equal; in extent, it is about one-half as large as the scutum; metascutum with the two halves remarkably large and broad; scutel-

* Classification of the *Carabidae* of the United States. Transactions of the American Philosophical Society, vol. x, 1853. On the Systematic Value of Rhynchophorous Coleoptera. American Journal of Sciences and Arts, vol. xlv, July, 1867. Classification of the Coleoptera of North America. Miscellaneous Collections, Smithsonian Institution.

† Notes on the Family *Zyganidae*. Proceedings of the Essex Institute, April, 1861.

‡ Characters of the Noctuidae. Proceedings of the Portland Society of Natural History.

§ L'Anatomie comparative des Parties solides des Insects. (Ann. gén. des Sc. Phys., 1820, tom. 7). Recherches anatomiques sur le Thorax des Animaux articulés et celui des Hexapodes en particulier. Acad. Sci., 1820.

lum equilaterally triangular, being remarkably long and narrow, where in other families it is transverse and about a third shorter than wide.

Pleurum.—The epimera and episterna are narrow and rather long compared with the *Tineidae*, while the coxæ and trochantines are of remarkable length and slenderness.

Tineidae (*Scardia boloti* Fabr., an European species, pl. 7, fig. 10, 10*a*).—In this family the thorax is much shorter than in the *Pterophoridae*, and the flanks less oblique.

Tergum.—Mesoscutum much larger proportionally than in *Pterophorus*, and more scutellate in shape; scutellum short and small, the surface very convex. Metathorax: scutum large, not separate, united for about half its length by suture; the praescutum large and distinct, triangular in shape. The scutellum is of the shape usual in other families, but longer and narrower, though still very different from that of *Pterophorus*.

Pleurum.—While the thorax is still long and slender, it is much shorter than in *Pterophorus*. The thoracic segments seen laterally are very oblique, and the costa and trochantines of all these segments are very long compared with the epimera and episterna.

Tortricidae (*Tortrix*, sp. undetermined, allied to *T. rosaceana* Harris, pl. 7, fig. 11, 11*a*).—Here the thorax is very short and subspherical.

Tergum.—Mesoscutum very short, and rather broad; scutellum rather large in proportion to the scutum, both ends pointed much the same; meta-praescutum obsolete; scutum short, the two halves just touching on the median line of the body; scutellum very short, but distinctly triangular.

Pleurum.—The thorax is much shorter, more spherical than in the *Tineidae*; the flanks are much more vertical than in the *Tineidae*, and are in this respect much as in the higher families. The epimera and episterna are broad and long in proportion to the coxæ and trochantines united. The latter are short and thick, somewhat swollen, much more so than in any of the allied families.

Pyralidae (*Botys* sp., pl. 7, fig. 12, 12*a*).—The thorax in this family is usually rather long and slender; that of *Botys* is selected as a mean between the extreme forms.

Tergum.—Mesoscutum moderately long and large, much longer than in *Tortrix*; the scutellum very large, about as large in proportion to the thorax as in *Pterophorus*. It is slightly longer than broad, and nearly equilaterally

square, almost as long as the scutum in the middle; metascutum short, the two halves being united by a very short isthmus. The scutellum is short and crescent-shaped.

Pleurum.—The flanks are very oblique. The coxae and trochantines collectively are rather short, thick, and somewhat swollen, though not so much so as in *Tortrix*.

Phalaenidae (*Eutrapela transversata*, pl. 7, fig. 21, 21*a*).—We now come to moths in which the thorax becomes more spherical and concentrated than before. This is due to Andouin's law of enlargement of one part of a segment at the expense of an adjoining part. The differences may be best brought out by comparing the thorax of an *Eutrapela* with a *Hadena*. The entire thorax is longer than in *Hadena*; the flanks are more oblique.

Tergum.—The mesoscutum in the median line is about as long as the entire piece is wide. The scutellum is considerably shorter than wide, and does not differ from that of *Hadena*. The two pieces of the metascutum are widely separated by a distance nearly equaling the width of the scutellum. The latter is very short, transversely linear-oblong rather than crescent-shaped.

Pleurum.—The epimera and episterna are rather narrower and scarcely as long as in *Hadena*, while the coxae and trochantines are longer and much narrower. The proportions are the same in *Anisopteryx pomataria* ♀, Pl. 7, Fig. —.

Noctuidae (*Hadena destructor*, pl. 7 fig. 15, 15*a*).—The thorax is shorter, more spherical, and the flank less oblique than in the *Phalaenidae*.

Tergum.—Mesoscutum shorter on the median line than broad. The two halves of the metascutum are not so widely separated as in the *Phalaenidae*, the distance between them being equal to about half the width of the scutellum. The scutellum is linear crescent-shaped.

Pleurum.—The characters have already been brought out in the description of the *Phalaenidae*.

Bombycidae (*Telea Polyphemus*, pl. 7, fig. 16, 16*a*).—The thorax in *Telea* is not so spherical as in *Hadena*, while the flanks are much less oblique.

Tergum.—The mesoscutum is shorter than in the *Phalaenidae*, while the scutellum is equilaterally triangular, being less produced behind than usual. The two halves of the metascutum are widely separated, much as in *Hadena*, and the scutellum is much the same.

Pleurum.—The epimera and episterna are rather large, while the coxae and trochantines are shorter and broader than in the *Acrididae*.

Zygariidae (*Zygaria* near *longicosta*, pl. 7, fig. 17, 17a).—*Tergum*.—Mesoscutum somewhat compressed, narrowing in front; scutellum as long as wide, well-rounded posteriorly; metascutum with the two halves widely separated by a distance equal to the width of the scutellum.

Pleurum.—Epimera and episterna of the mesothorax very broad. The meso-trochantines and coxae unusually short and broad, the trochantines especially much swollen.

Egeriidae (*Egeria scitula* Harris, pl. 7, fig. 18, 18a).—Notwithstanding the slenderness of the body, the thorax is quite spherical, in some respects much as in *Zygaria*, while along the tergum the thorax is rather long and narrow; the flanks are short and broad.

Tergum.—The tegulae, which I have not hitherto attempted to describe, are very large and broad. Removing them, the mesoscutum is seen to be remarkably long and narrow, not much wider than the scutellum. The latter is as long as wide, well pointed behind. The two halves of the metascutum nearly touch each other; scutellum very small, in the form of a flattened triangle.

Pleurum.—While the flanks of the prothorax are rather more slender than usual, more so than in *Zygaria*, those of the two hinder segments, especially the metathorax, are shorter and broader. The epimeral and episternal pieces of the two hinder segments are large and broad. The coxae and trochantines are very short and broad, particularly the meta-trochantine, where in *Zygaria* and *Tela* it is long and comparatively slender.

Sphingidae (*Deliophila livcata*, pl. 7, fig. 19, 19a).—In the thorax of *Egeria* we have a close approximation to that of *Deliophila* and the *Sphingidae* generally, as well as the *Papilionidae*, as shown in the short, broad, full flanks and very long, narrow mesoscutum.

Tergum.—Mesoscutum long and narrow, slightly wider than in *Egeria*. Scutum much shorter posteriorly than in *Egeria*. The metathorax is very short, the two halves of the scutum are small, widely separated by a distance nearly equaling the width of the scutellum. The latter is shorter than in any of the previous families, forming a sinuous transverse ridge.

Pleurum.—The epimera and episterna are short and very broad, while the coxae and trochantines are very short and broad. The middle trochan-

tine is nearly equilaterally triangular, while the metacoxa is nearly as broad, the trochantines of both segments being very short and small.

Papilionidae, (*Vanessa atalanta*, pl. 7, fig. 20, 20*a*).—The entire thorax is relatively shorter, more compressed, the tergal portion descending farther down the sides, the epimeral and episternal pieces being much shorter than in any of the moths, while the coxæ and trochantines collectively are full as short as in the *Sphingidae*.

Tergum.—Mesoscutum long and narrow, not much wider than the scutellum; the latter is very large, elevated, both ends much alike, the posterior end being much produced, so that in outline each side is nearly of equal length. The metathorax is more vertical than in the moths; the scutum is large, the two halves not quite touching. The scutellum is very small and narrow, vertical instead of horizontal, as in the moths, subtriangular, very short and linear.

Pleurum.—Episternal and epimeral pieces very short; middle trochantine short and broad, triangular; hind trochantine larger than the coxæ, where in the *Sphingidae* it is much swollen.

The prothorax, which is so slightly developed tergally, has not been described in these notes, and the tergum has not been figured. This comparison of the thorax in different groups confirms the relative standing of the families as usually given. The *Pyralids* should stand below the *Phalaenidae*, and the latter below the *Noctuidæ*.

The *Phalaenidae* hold a middle position between the moths below them and the *Noctuidæ*, while the *Egeriæ* and *Sphingidæ* have strong resemblances to the *Papilionidæ*; the *Bombycidæ* and *Zyzenidæ* being more closely allied to each other than to any other groups.

§ 6. ANATOMY OF THE MALE GENITAL ARMATURE.

These organs, as in other orders of insects, differ much in form even in different species of the same genus, so that it is impossible to lay down any characters applicable to the family generally. I will briefly describe some forms in certain of the typical genera of the family.

In *Petrophora truncata* (pl. 7, fig. 24, 24*a*, 24*c*), the parts are, on the whole, more largely developed than in any other species of the family. The supra-anal plate (pl.) is large and broad, subtriangular or rather scutellate; considerably longer than broad, rounded at the apex, with the two halves

closely united by suture; the recurved spine attached to it is very long and stout; the lateral claspers (*lc.*) are very long, broad, spoon-shaped. In *Petrophora diversitincta* the armature is entirely different. The end of the abdomen is large, long, square, and membranous. It conceals the armature, and the ends of the claspers are even with the end of the membrane. On removing this, the proportions of the parts are much as in *P. truncata*, but smaller; the lateral claspers are narrower and somewhat pointed, and the supra-anal plate is shorter.

In *Glancephoryx polata*, the genital armature is very different from that of *Petrophora truncata*, so much so as to afford excellent generic characters; and those who with Lederer do not believe in separating the lower genera of the *Larentina* as done by Hübner, Stephens, Guenée, and others, would do well to take into consideration the excellent generic characters afforded in the male genital armature.

In *G. polata*, the lateral claspers are very large; the lower portion is large and spatulate, reaching as far beyond the supra-anal plate as in *Petrophora*; but the middle is membranous, and, at what would correspond to the upper edge in *Petrophora*, becomes converted into a chitinous edge, which ends in a long, acute spine; the upper edge of this sharp chitinous portion has a deep sinus at base, and the mucronate tip does not extend as far out as the tip of the spatulate portion. The chitinous portion at the first glance looks as if it were a separate appendage; but the lower edge on examination appears continuous with the membranous spatulate portion. This chitinous portion does not appear to be represented in *Petrophora*. The supra-anal plate is smaller than in *Petrophora*, and membranous at base and in the middle, the edge forming a broad rim, being solid and chitinous. The recurved spine attached to it is very large.

In *G. sabitii*, there is also an upper solid chitinous portion, which is full and rounded at the end, instead of pointed, and this portion is much larger than the membranous portion, projecting considerably beyond it, the expanded rounded end encroaching on the membranous portion, and much hollowed on the lower edge, slightly sinuous on the upper and free edge. The supra-anal plate is broad and solid, with no median suture, and the end is slightly excavated. Thus it seems that, while very different from *G. polata*, the two species agree in having the upper edge of the lateral claspers solid and chitinous. Though quite different in form from that of *G. polata*, I should still regard the differences as subgeneric.

In *Eupithecia miserulata*, the terminal segment is large, square, and membranous, much as in *Lygria diversilineata*; but the large spatulate claspers end on the upper edge in a long, recurved, partly chitinous hook, meeting with its fellow over the spine of the supra-anal plate. This last is membranous, the edge solid, with a median solid portion from which the spine arises. There is also a large sharp infra-anal mucronate chitinous plate.

In *Eupithecia absynthiata*, the end of the abdomen is covered with a conical membrane covered with scales, in which I could perceive no suture; after removing the scales with a hair pencil, I was obliged to rupture the membrane before laying open the genital armature. The latter then appeared covered with scales. From this it would appear that immediately previous to copulation this membrane is ruptured and possibly cast off. The lateral claspers are very large, long, pointed triangularly. The supra-anal plate is short and broad, entirely different from that of *E. miserulata*; the recurved spine is membranous, forked, and apparently immature. The moth was very fresh, and evidently was not sexually mature.

In one *E. subapicata* which had not copulated, the terminal segment of the abdomen is conical, with no suture above or beneath, but perforated at the end, out of which projected the extreme tips of the lateral claspers. This membranous covering is evidently preputial in its function. The claspers are entirely different from those of the two other species, being widely and unequally forked. The supra-anal plate is much as in *E. miserulata*, but less membranous. The recurved spine is large and solid, with a broad truncate tip.

In an individual of *Hydriomena trifasciata*, in which the parts of the armature were separated, and the insect had evidently used them, they are much as in *Lygria truncata*; the lateral claspers are, however, much broader at base, subtriangular at tip; the supra-anal plate is remarkably short, with a median suture, and terminating in a square expansion, from which arise two long spines, blunt, not much curved. Thus, here we have a new character added to separate this genus from *Petrophora* or *Glaucopteryx*; *i. e.*, the forked supra-anal spine. In *Eupithecia* only have I seen it separated, and then in an immature individual.

Not having farther time to spend on this subject at present, I will leave the matter so far as relates to the *Larentinae*, and go to another group, merely remarking in passing that, after a study of the genital armature, it seems an

unnatural combination to place under a single generic head the genera united by Lederer, Standinger, and others, under *Chloria*.

Zerene calenaria.—In this species the lateral claspers are large and long, oval, obtusely pointed at tip, with the upper edge thickened like the back of a back-saw. The supra-anal plate is very small, broad, and short; the spine broad at base, short and stout; the last segment partly covers the armature.

In *Acidalia nucleata* the supra-anal plate is small, solid, triangular; the spine large and double; the lateral claspers are very small, full and rounded, with a deep sinus on the upper edge. There is also a pair of large, solid black chitinous hooks, which I have not noticed in the previously-mentioned genera.

In *Gneneria fidiculata* the last segment entirely covers the armature; the lateral claspers are very long, membranous, extending far beyond the rest of the armature; the supra-anal plate is very complicated, the end being divided into two rounded, flat concave portions, from beneath which projects the broad, incurved triangular spine.

In *Aphodes mimosaria*, the armature is covered as usual; the lateral claspers are very long, subspatulate, the upper edge chitinous, the chitinous portion expanding and bent up at right angles at the end, and ending in a broad, mucronate point. The supra-anal plate is rather large, scutellate, membranous in the middle, and the spine is very long and slender, with the end blunt.

In *Cynatophora ambrosaria*, the supra-anal plate is moderately large, acute, scutellate, ending in a rather short spine; the lateral claspers are large and long, moderately broad, spatulate, the end curved up a little and meeting its fellow on the median line of the body; on the inside, at the bend in the outer edge, is a small bunch of short, acute spinules.

In *Endropia bilinearia*, the lateral claspers are large, very broad at the base, somewhat upcurved, the end broad subspatulate, a deep sinus on the upper edge, with a long spine projecting inward from the base of the upper edge. The supra-anal plate is small, triangular, depressed.

In *Cuberodes metracamparia*, the lateral claspers are moderately large, broad at the base, the upper edge straight, the end rounded, the lower edge bent up a little. It is unarmed. The supra-anal plate is large, broad, triangular, with the median suture very deep. The spine is large, and reaches as far as the end of the lateral claspers.

In conclusion, it seems that the male genital armature, irrespective of the intromittent organ, consists of a supra-anal plate, a recurved spine (usually simple and acute), and of a pair of large, subspatulate, usually simple, lateral claspers; and that all these parts are usually concealed by the large, square, and open, or conical and closed terminal (in the imago) segment of the abdomen, which is necessarily ruptured before the parts can be put to their normal use.

The male armature is much simpler in the *Phalænidae* than in some of the *Noctuidæ*, where the lateral claspers are often very complicated (as in *Hadena destructor*), though they are much as in *Agrotis tessellata*. The supra-anal plate and spine are much alike in certain genera of the two families. I doubt, however, if any reliable family characters, separating the *Noctuidæ* from the *Phalænidae*, can be drawn from the genital armature.

§ 7. COMPARISON WITH OTHER FAMILIES OF LEPIDOPTERA.

Comparing the denuded head of the *Phalænidae* we have described with a typical Noctuid, such as *Mamestra arctica*, the eyes in the *Phalænidae* are fuller, more spherical, nearer together; the clypeus much longer and narrower; the epicranium is a little smaller in proportion, narrower, and more elevated, while the occiput is longer in proportion to the width; the labrum is rather smaller and shorter, while the maxillæ are shorter, smaller, and weaker. Indeed, the shortness of the occiput in *Mamestra* carries the whole front back, and it is less vertical than in the *Phalænidae*. This is seen especially in *Eutrapela* and *Cydlimon*, where the front of the head is much longer and narrower than in the *Noctuidæ*.

Now, turning to the hitherto doubtful genera *Doryodes* and *Pachygnemia*, they agree well with the relations of parts in *Mamestra*. The head is much alike in both of these genera; the ocelli are nearly as large in proportion, and as shining black, as in *Mamestra*, in color differing entirely from the ocelli of the *Phalænidae*, which are almost indistinguishable in color from the surface of the head. In these two genera, also, the epicranium is larger than in any Phalænid known to me, forcing back, as it were, the occiput out of sight, the latter being very short, merely a transverse rim on the posterior edge of the head. The clypeus in *Doryodes* is scarcely longer than its width at the base, and it is still shorter in *Pachygnemia*, with the edge thickened

and much rounded. The maxillæ in these genera are still stouter than in any Phakenid with which I am acquainted.

In the venation these genera are true *Noctuidæ*; the subcostal cell is formed by the anastomosis of the second subcostal venule with its main vein, and there are four median venules. *Pachygenia* and *Doryodes* are nearly identical in their venation. The former genus, in the shape of the wings, is also truly noctuiform. I have been unable to find in the account of the caterpillar given by Boisduval, and quoted by Guenée and Newman, whether it is a geometer or not, but suppose it is; but there are larvæ of the *Noctuidæ* which are partially loopers; for example, *Tarache candefacta* has but three pairs of abdominal feet, and is a looper. The palpi of *Pachygenia* are much like those of the *Phalanida*.

In *Doryodes*, *Ligia*, and its ally, *Sudatiophora*, recently placed by Professor Zeller* among the *Phalanida*, the palpi are truly noctuiform, as well as the shape of the wings.

The *Phalanida* are sometimes confounded with certain *Bombycida*, such as *Drepina* and its allies, *Platypteryx* and *Dryopteris*, but here a slight examination of the structure of the head and the venation is sufficient to show that the resemblance is one of mere analogy.

With *Euphanessa*, a nearly ally of the European genus *Nudaria*, the case is different, since Mr. W. Saunders's† discovery of the larvæ of this genus. By raising them from the egg, he ascertained that the larvæ are loopers. He says that "they were extremely active, about one-tenth of an inch long, with cylindrical bodies, and true geometers in their larval characteristics and mode of progression," with two pairs only of abdominal feet.

I have carefully reexamined this genus which was proposed by myself and placed next to *Nudaria*, and am still of the opinion that this is its proper position. In the small head, with the large occiput and the male genital armature, it is much like *Crocota*; the antennæ and legs are much as in other Lithosiæ. The venation, though different in some important respects from that of *Crocota* (there being a subcostal cell where there is none in *Crocota*, and but five subcostal veins where in *Crocota* there are six), is still Lithosian in

* Verhandlungen der K. K. Bot. Z. G. S., 1872, 489. *Doryodes* and *Ligia* are, in Lederer's 1860 and Guenée's works (1857), and in Standinger & Wocke's Catalogue (1871), placed among the *Phalanida*. Dr. Clemens was the first, as I am informed by Mr. Grote, to remove *Doryodes* to the *Noctuidæ*. In Grote's catalogue of the *Noctuidæ*, *Doryodes* is included in that family.

† Canadian Naturalist, iii, 1871, 227.

its plan, there being four median veins. On a fresh comparison of *Euphanessa* with European examples of *Nudaria*, I see no reason to doubt the clear sub-family relations of the two genera.

In these characters, then, viz, the smaller occiput and epicranium; the longer and larger clypeus, in proportion to the two other pieces; in the venation, there being but three median veins; in the longer thorax, with more oblique flanks, and in the genital armature, as well as less essential features, the imago Phalanids differ from the *Bombycidae*.

From the Pylalides, especially the Deltoids, the Phalanids differ as regards the more external characters, *i. e.*, in the shorter palpi, particularly the second joint, and in the fore-legs being simple, without the tufts and pencils of hairs which adorn the legs of the Deltoids; also, in the shape of both pairs of wings, as well as in the want of the long projecting scales of the vertex seen in the Deltoids, and in the shorter front of the head.

In the more essential features, such as the form of the pieces of the head, and the venation, the Phalanids differ from the Deltoids in the same way as they do from the Noctuids.

Larva.—The body is unusually long and slender, cylindrical, sometimes slightly flattened; there being, besides the three pairs of thoracic legs, usually two, rarely three or four, pairs of abdominal legs. The head is usually not quite so wide as the body, but sometimes larger and wider, and is, as a general rule, smooth, but sometimes angular, or the epicranium is prolonged on each side into a large tubercle. The abdominal segments are sometimes (in the higher genera) variously ornamented with tubercles; sometimes, as in *Nematocampa*, forming long, curved filaments. The supra-anal plate is large, triangular. The terminal feet are often prolonged posteriorly at their base into spines; and there is a median spine projecting between the pedal spines. The larvæ differ from those of the Noctuids and Pylalids in the smaller number of feet and the looping gait, so that, except in a very few instances, where certain *Noctuidæ* are semiloopers, need they be confounded with the larvæ of those families.

They either spin a slight, thin cocoon among leaves; or are free, attached to twigs, or are subterranean, remaining loose under the surface of the soil, or forming a rude earthen cocoon.

Pupa.—As a rule, the pupa is rather thick a little in front of the middle of the body, thence tapering rapidly to a point, the posterior half being con-

ical. The wing-covers usually extend to the sixth ring from the end of the body, *i. e.*, to the hinder edge of the fourth abdominal segment. The tip is acute, with sometimes three pairs of curved, stiff filaments arising from the solid tip. As in *Nematocampa*, or in *Anisopteryx* which is subterranean, the terminal spine is long and tridactylate at the end, and the long, curved filaments are wanting.

In the subterranean pupæ, the color is of the usual uniform dark reddish horn-brown hue. In those which live exposed, the color varies, the pupæ being banded and spotted with whitish and pale-reddish tints.

Compared with the pupæ of the *Noctuidæ* and *Pyralidæ*, those of the present family are more pointed, conical, and variegated, while those of the latter are always dull reddish-brown.

§ 8.—INTERNAL ANATOMY OF THE LARVA.

Anatomy of the larva of Zerene catenaria.—The following notes are drawn up from a dissection of the larva of *Zerene catenaria*. The œsophagus is not so long as in *Datana ministra*, and its junction with the proventriculus is not so distinctly marked as in *Datana*. The intestine is much as in *Datana*. The cecum is much the same, but without the well-marked longitudinal bands on it. The six urinary tubes are as in *Datana*; they are once folded, and the end of the fold reaches nearly to the middle of the body. The silk-glands are longer than the body by a distance equal to the thickness of the latter; being shorter than in *D. ministra*, in which they are longer than the body by one-half the length of the latter. They are folded in the same manner in both; being folded twice, the folds parallel, and situated along the under side of the intestine. There is a pair of dorsal yellowish glands lying parallel to the median line of, and resting above, the intestine. Each one is as thick as the terminal third of the silk-glands, not diminishing in thickness in the head as do the latter. These glands are about one-fifth the length of the entire body, and pass into the head on the sides, and are situated much farther apart than the salivary glands.

Anatomy of a Nematus (?) larva.—The following notes on the internal organs of a saw-fly larva, probably *Nematus*, or a closely-allied form, are introduced for purposes of comparison. The digestive system is much as in *Datana ministra*. The œsophagus is small and short; not so long as the

ventricle is wide. The latter is a simple tube of uniform width. No ileum. A very small, short cecum, as thick as the œsophagus, and but little longer; it is slightly dilated in the middle. The salivary glands are large and well developed, and when stretched out are about half again as long as the body, but are folded up in short, close, sigmoid flexures, not in two long folds, as in lepidopterous larvæ. The urinary tubes are about thirty in number and rather short (there are four in *Bombus* larvæ), emptying into the pyloric end of the stomach. The cecum and posterior end of the alimentary canal are much as in *Datana* and *Zerene*, there being no colon.

Anatomy of the larva of a Phryganeid.—To show in what respect the larvæ of the *Phryganeidæ* differ from lepidopterous larvæ, I introduce the following notes made during the dissection of a larva of this family; the genus unfortunately not determined. The salivary glands are very long, filiform, and make a long fold opposite the pyloric end of the ventricle, then, turning around at the anterior third of the colon, they return, ending at the pyloric end of the ventricle, extending, when stretched out, beyond the body by one-fourth the length of the latter. The alimentary canal is no longer than the body, not being convoluted. The œsophagus is rather large, equaling in length that of the head. It dilates not very suddenly into the proventriculus, which latter is long and rather large, with transverse prominent muscles. The ventriculus is about as long as, but considerably larger than, the proventriculus, elongate-pyriform, thickest on the anterior third; the surface is covered with thickened portions like a pavement. The colon is dilated behind the ventricle into an oval region, about three times as long as thick, suddenly contracting behind, and then dilating toward the rectum; the larger anterior region is about one-third as long as the posterior. There are six long, slender urinary tubes, reaching, when stretched out, to the head.

§ 9.—HABITS OF THE SPECIES.

The geometrid moths have not a strong flight. When disturbed, they rise from their resting-place on the upper or under side of some leaf, and fly off in a weak, vacillating way, to light on some neighboring leaf or trunk of a tree. They seldom fly more than a rod or two. At rest, they usually spread the wings almost flat, the hind body being nearly uncovered.

The species are found in fields adjoining woods, and in forests. They

are seldom found in open grass-lands, as with the *Noctuidæ*, except a few species, chiefly *Larentina*, which gather about houses. In Maine, where I have observed them for many seasons, the geometrid moths begin to appear during the last week in May, when *Lazogramma diffluenta* begins to appear in dry, open fields near pine-woods, and soon after *Nemora grataria*, *Falcatia notataria* and *truncataria*, *Cornuta costulata* and *semigrata*, lead off the hosts that soon follow. During the last of May, *Phanyleia flavata* and *Odynera designata* and *perugata* enter houses, attracted by the light. About the middle of June, the *Eumomina* begin to appear, and are most abundant late in June and in July in hard-wood forests. During the middle of June, the species of *Camatophora* (*Boarmia*) and *Tephrusia* also appear in pine-woods, often clinging to the trunks of trees in shady places.

In Massachusetts, the season opens a week earlier, and in the Middle States a week or two still earlier. In Colorado, June and July are the best collecting-months. In Vancouver Island, Mr. Crotch collected with great success in July. In California, the winter-months and March are good collecting-seasons.

I have not attempted in this essay to generalize the times of appearance of our geometrids, but to carefully give, so far as I have been able, the dates of capture in connection with the localities.

§ 10.—DEVELOPMENT OF THE THORAX OF THE IMAGO.

The following observations relate to the development of the different parts composing the segments of the thorax in a Tineid moth. They were made many years ago on the larvæ of a Tineid moth, found in the nest of *Odynerus albophaletatus*. The caterpillars had been paralyzed by the sting of the wasp, and, though incapable of motion, in one or two cases had sufficient vitality to pass into the pupa state. Some of the drawings were made from life by myself; others, from alcoholic specimens, by Mr. Emerton. Unfortunately, the specimens have been lost, and the following description is accordingly drawn up from the sketches, which represent the specimens just as they appeared, with the pupal integument showing very plainly through the thin, tense, larval skin. The species to which the larva belonged is unknown. It was a green caterpillar, of the usual form, and seemed to be a Tineid rather than a Tortricid.

Fig. 1. 1a, pl. 7, side-view, shows the first stage of the semi pupa.

The prothoracic ring is unchanged, while the metathoracic ring is already much diminished in size, and the outlines of the primitive form of the mesoscutum are indicated.

Fig. 2 represents an extremely interesting stage; the prothoracic ring is now much smaller; the mesothorax is large; the scutum is well marked; while the metathorax indicates the scutum deeply hollowed out, apparently to receive the mesoscutellum.

Figs. 3, 3*a*, 4, 4*a*, 5, 5*a*, represent a more advanced stage. The thorax is more swollen, and has assumed somewhat of the characteristic form of the imago, but the abdomen is still as seen in the larva.

In figs. 6, 6*a*, the semi-pupal condition is nearly completed. The proportions of the three thoracic segments now approach those of the imago. The prothorax is still undifferentiated; but the scutum is well marked, though the drawings do not indicate that the scutellum has been separated from the scutum. The abdomen is now much contracted, and of the pupal proportions.

Fig. 7 is a dorsal view of the end of the semi-pupal stage.

Fig. 8 represents the pupa. Owing to the paralyzed, enfeebled state of the larva, the ends of the wings have not reached the end of the depression in the under side of the abdomen.

The facts here given are, however, sufficient to show that the transformation of the larva into the pupa is a very gradual process, and may be compared with the stages that I have already showed to exist in the semi-pupal condition of *Bombus*.* It seems that the pieces of the thorax are indicated during this stage, but that the scutum of the prothorax and metathorax do not separate until the close of the pupal life, while the mesoscutellum does not become differentiated until after pupation. This process must go on in the hypodermis of the pupa, which is destined to form the imaginal integument.

§ 11.—SECONDARY SEXUAL CHARACTERS OF THE IMAGO.

The more apparent sexual characters of the adult Phalenids consist in the antennæ being ciliated or pectinated in the male, and simple or sub-simple in the female. The head in front is wider in the female than in the male, as in other *Lepidoptera*. The wings, particularly the anterior pair, are broader and blunter at the apex in the males than in the females. The abdo-

* Observations on the Development and Position of the Hymenoptera.—Proceedings Biol. Soc. Nat. Hist., N. 1866, 279. ω

men, in fact the whole body, is shorter and stouter in the female, while the genital armature is widely different. These are sexual differences to be found in all the families of moths.

In the Phalaenids occur, as in some *Bombycidae*, namely, the species of *Orgyia*, genera in which the females have only the rudiments of wings. There are also other important differences, which we would draw attention to.

The female *Hybernia* differs from the male in the body being much shorter and thicker; in the scales being finer and shorter; in the simple antennae and slightly stouter legs. The palpi are of nearly equal size in both sexes, being remarkably short and hanging down. Denuding the head and thorax, the head is considerably smaller in the female than the male, and the eyes are less rounded. The front of the head is proportionately shorter and broader, and less depressed between the eyes; the epieranium and clypeus are a little fuller than in the male; the clypeus is shorter and broader than in the male.

But the most remarkable changes are seen in the female thorax, where the entire tergum of the thorax is smaller than that of the first abdominal segment. The female thorax of *Hybernia* is so much like that of *Anisopteryx* that I will reserve further descriptive remarks until the thorax of that genus has been described.

The head and body of the female *Anisopteryx verrata* differ from those of the male, when undenuded, much as those of the female *Hybernia* from the male. The differences in the head (pl. 7, fig. 26) are much greater in *Anisopteryx* than in *Hybernia*, the head being wider. The head is smaller and much wider in front, and the eyes much smaller in the female than in the male. In the female, the occiput is a transverse, narrow rim; the epieranium is small, narrow, subtriangular; while the clypeus is subscutellate, as broad as long, with the front edge narrowing a little, and the margin revolute; the surface is rather convex. The thoraces of the male and female of *A. pomataria* have been engraved. The thorax of the male (pl. 7, fig. 13, 13a) is of the usual form, differing but little from that of *Eutrapela*. In the female (pl. 7, fig. 14, 14a), however, the mesoscutum is about one-fourth as long as wide, the hinder edge being slightly excavated; the scutellum is very short and wide, transversely narrow lozenge-shaped. The metathorax is remarkably short; the distance between the two halves, which are widely separated,

being equal to the length of the mesoscutellum. The metascutellum is a very (transversely) narrow piece, nearly obsolete.

The pleurites, or pieces of the flanks, are very narrow and oblique. Above them are inserted the rudimentary wings, which are minute tubercles: the posterior pair about half as long as the anterior pair. The flanks of the prothoracic ring, including the coxae and trochantines, are as large as those of the two posterior segments. The flanks of the mesothorax are so much like those of the metathorax that a description of one will answer for both. The episterna are long and moderately wide, while the epimera are very narrow, almost linear. The pieces making up the episterna and epimera collectively are of the same width, and nearly as long as the basal segments of the legs (coxae and trochantines collectively). The coxae are moderately wide, while the trochantines are very narrow, being almost linear.

The thorax of *Hybernia* differs in the mesoscutum being slightly longer, the hinder edge not being excavated, while the scutellum is not distinctly lozenge-shaped. The metascutum is much smaller than in *Anisopteryx*, the two halves being much more widely separated, while the scutellum is very short, transversely linear, and very wide.

In *Phigalia maculata* G. & R., the wings of the female are much larger, the pads being either nearly as long as the thorax or longer and wider in proportion. They differ in size in different individuals. The patagia are nearly as large as usual. The specimen from which the following description is made is one in which the wings are not quite as long as the thorax.

The head of the female is a little smaller, and much narrower between the eyes than in the male; but the difference between the two sexes is, in this respect, not so great as in the two other genera. The occiput and epicranium are much as in *Hybernia*. The clypeus is nearly square, being as long as wide, not narrowing much in front, and very full on the surface. The palpi are better developed than in the other genera mentioned; and the maxillae are very short, as in the other genera, scarcely reaching beyond the tips of the palpi.

The thorax is much larger than in the two other genera mentioned. The two halves of the prothoracic scutum are rather smaller than in the male, but well developed. The mesoscutum is much longer than in the two other genera, being fully half as long as wide, and rather deeply excavated posteriorly to receive the scutellum, which is about one-third as long as wide, being

narrower and proportionately longer than in the others. The metathorax is much more like the male than in the two other genera. The two halves of the scutum are broad, similar in form to those of the male, but more widely separated. The scutellum has the peculiar transversely oblong form of the male, but more exaggerated, being shorter and wider. The flanks are much wider and the pieces shorter than in the two other genera; the principal difference being that the trochantines of the meso- and meta-thorax are much wider, more triangular. In this and other respects, the thorax of the female *Phigalia* is much more like the male thorax than in *Hybernia* and *Anisopteryx*, and this difference in structure is correlated with the larger wings. In all these characters, the female *Phigalia* is intermediate between the normal phalaenid females and the apterous species.

A third step towards the normal female form is seen in the female *Oporochoptera boreata*. On examination of a male and female received from Europe, I find the following differences between the sexes: The head is as large, if not larger, in the female as in the male; but the eyes are still somewhat smaller and less rounded. The front of the female is much wider. The palpi are as large and well developed as in the male, being much longer than in the three previously-named genera, while the maxillae are as long as usual in normal females, being rolled up between the palpi. The occiput is rather long and large: the epieranium large, very convex: clypeal region square, as long as wide: orbits well marked: the clypeus narrows a little in front, the edge being distinctly emarginate: the mandibles as large and scitiferous as usual. The wings are equal in size: the hinder pair being as large as the anterior pair. They are marked as described beyond in the specific description. In the fore wing, the discal cell is very large. There is a large subcostal cell situated near the apex, and the median venules are very short. The submedian fold is very distinct, and the internal vein well marked.

The thorax is about as large as in the male; the two halves of the proscutum and tegulae much as in the male. The mesoscutum is nearly square. The scutellum is large: being half as long as wide. The metascutum is very widely divided, the two halves being nearly as large as in the male: while the scutellum is of the usual shape, but very short and wide. The episterna and epimera collectively are shorter in proportion to the coxae and trochantines collectively than in the three other genera. The coxae and trochantines of the metathorax are much longer and narrower than those of the mesothorax.

We thus have successive stages of degradation from the nearly winged

female *Cheimatobia* to the entirely wingless *Anisopteryx*. The facts are simply here recorded. The causes which have led to such fundamental secondary sexual differences are interesting subjects for speculation.

In the genus *Lobophora*, the males are distinguished by the large lobe, or bubble-like expansion, at the base of the inner edge of the hind wings. In *Calocalpte undulata* and the species of *Scotosia*, the males are distinguished by the large ear-like expansion of the inner edge of the hind wing, and by the tuft of hairs.

§ 12.—ORIGIN OF THE GENERA AND SPECIES.

It will be noticed that the tendency in this work has been to unite what some might regard as distinct varieties, or even species, as I have myself done until receiving better material. This course of treatment has been applied especially to the circumboreal species. It has been done in dealing with species described by myself as well as others, so that the work has been performed as impartially as the material would warrant. There is a tendency in some European authors to multiply species unnecessarily; and it is not unlikely that many species of this family will ultimately be regarded as varieties. At the present day, two methods are in use by evolutionists: one, to multiply varieties, calling them incipient or "Darwinian" species; the other, to unite them. It is sometimes a difficult question what to do. The work should be done on the merits of each case, without being influenced by theory. This would be easy enough to do if the varieties and species were fixed. They often vary so greatly that no two persons can agree on the same species; their opinions varying with the number of specimens and the geographical extent of the area collected from. Our ideas will undergo a revision when we know the life-histories; though often the larvae vary much, while the imago is stable.

My descriptions, then, may be looked upon as provisional, and doubtless will have to be modified. The number of so-called species tends to be reduced as our specimens and information increase.

The genera, also, are as artificial creations as species and varieties. The work of the systematic biologist often amounts to little more than putting nature in a strait-jacket.

In some genera, as *Hyperctis* and *Bourmia* and others, scarcely any two specimens, as they exist in our museums, seem to be alike. Sometimes, the individuals differ so much as to indicate the formation of sports, strains, or incipient varieties. It is so with some genera. For example, had we no

Semiothisa californata, no *Phastaco orillata*, no *Thamnonoma guayana*, it would be easy to define these genera, and separate them by well-marked characters; but the lowest species combine more or less the characters of the different genera, and the three groups seem to diverge from a form like any one of the above-mentioned species. Such species are synthetic types, combining the characters of the three genera to which they belong. It is impossible to say which of the three genera is the higher. In fact, they are somewhat parallel forms, like the topmost branches of a tree. It is so with the genera. *Thamnonoma* and *Eufitchia* vary in different directions in one or two or three characters, viz. in the venation, in the form of the abdomen, in the peripheral characters, and especially coloration. The genus *Eumacaria* is one of much interest, as, while closely allied to *Semiothisa* in its structural features, it anticipates *Epione* in its general appearance and markings, so that it would be easily regarded as belonging to the *Linominae*.

It thus appears that there may be synthetic types among species and genera. It also appears that there may be synthetic types between two families, such as *Doryctes* and *Suderiophora* and *Ligia*, which are Noctuids, with some phalaenid characters.

It is not improbable that these so-called synthetic or comprehensive types are ancestral forms from which other species and genera have diverged.

§ 13.—MIMICRY OF NATURAL OBJECTS.

No cases of mimicry of other insects, so far as I am aware, are known to occur among the larvæ or imagines of this family. That, however, the geometrid caterpillars closely resemble the twigs of the plants on which they rest was noticed by Linnaeus in the tenth edition of his "Systema Naturæ." The most remarkable example which has fallen under my observation is the larva of *Drepanodes rarus*, G. & R., which lives on the stems of the juniper-bush. The best description that could be given of it is to say that it would easily be mistaken, as it holds itself straight out motionless by means of its anal legs, for a portion of a twig of the tree on which it feeds. It is about an inch and a half long, and less than a line in thickness. Its body is quite



rough, with a few prominent tubercles, in size and form resembling the scales left by the falling-off of the leaves of the juniper.

That this is an illustration of protective mimicry, of service to the species, seems not unlikely. There are so many cases of this sort among the larvæ of this family that it seems unnecessary to adduce other examples.

§ 14.—TERMINOLOGY.

In describing the head, the term "*front*" applies to the region in front of the insertion of the antennæ, while the term "*vertex*" applies to the portion above and behind the insertion of the antennæ.

As regards the venation, the term "*venule*" is applied to the branches of the main veins. The branches are numbered from the first one thrown off to the last, going from the costa of the wing backwards (the costa being regarded as the front edge of the wings when expanded, as in flight). The *costa* is the front edge of the wing; the *outer edge* is situated between the apex and the inner angle; the latter situated at the end of the internal vein; while the *inner edge* extends from near the end of the internal vein to the insertion of the wing. Of the *discal vein* (which primarily consists of two veins), the portion sent off from the subcostal vein is called the *anterior discal*, and the venule thrown off from the median vein is called the *posterior discal*. The vein originating from the point of union of these two veins is called the *independent vein* by French authors.

Of the *markings on the wings*, there are often four or five lines, the inner of which is called the *basal*, the second the *median* or *intradiscal*, and the third the *extradiscal*; while there are often a submarginal line and a marginal line, the latter interrupted by the venules. See also the explanations of the plates.

DESCRIPTION OF THE GENERA AND SPECIES.

Subfamily I. LARENTINÆ Packard.

Eubolide and *Cularati* (in part), *Chesiadi*, *Melanthidi* (in part), Steph., List Lep. Br. Mus., 1833, 1839, 206, 213, 1836.

Larentida Guenee, in part., Phil., ii, 257, 1857.

Head large, rather long, and free from the thorax; front usually full and convex, either narrow or broad and subtriangular, usually with a frontal interpupal tuft. Palpi usually large and stout, with the third joint quite long and pointed, held beak-like in front of the head; but, in the higher genera, they often become short, not extending far beyond the front (very rarely, however, not extending to the front), with the third joint scarcely distinguishable at its base from the projecting hairs of the end of the second joint. Antennæ usually ciliated, very rarely with short and slender pectinations. Wings usually large, particularly the hinder pair; the fore wings often sub-falcate, with the costa full, sinuous, outer edge seldom slightly bent; hind wings usually large and rounded, with the inner edge long, or, in some of the higher and more aberrant genera, smaller than usual, short or oval, but never aborted; in one genus (*Lobophora*), with a swelling or blister near the base of the inner edge; in two genera (*Scotosia* and *Hydris*), with an ear-like expansion of the edge and brush-like crest of hairs. Venation: one, usually two, subcostal cells; first subcostal venule usually long, but sometimes scarcely longer than the second and third; independent vein situated in the middle of the discal space; posterior discal venule usually oblique and much bent. Abdomen usually long and slender; more or less tufted on the side and back, or rather stout, sometimes extending beyond the hind wings. Fore legs long and slender, unarmed, in one genus (*Lithostegæ*), with the tibiae short and thick, hind legs long, with the tarsi usually about as long as the tibiae; in one genus (*Halimommata*), thickened, and tarsi only half as long as the tibiae.

This is quite a homogeneous group, if as should plainly be done, we exclude *Oporthoptera* (*Chalcidatobia*) from it, which, though included in it by M. Guenée, should, I think, form the type of an equivalent group.

As regards the larval and pupal characters, we are, from our imperfect knowledge, not in a position to lay down any characters peculiar to the group. Guenée gives the following characters: "Larvæ more or less elongated, without any eminence; slightly or not at all attenuated, cylindrical, or distinctly flattened; mostly green, with distinct lines; head generally small and globular; living sometimes exposed, sometimes contained in a folded leaf, on trees and low plants. Pupæ contained in cocoons."

As regards the sequence of genera, I have placed *Eupithecia* first and lowest, in accordance with the plan of arrangement of the species.

Synopsis of the Genera.

- Species small; fore wings long and narrow; hind wings short, inner edge shorter than the outer edge..... *Eupithecia*.
 Species large; hind wings large; costa straighter and palpi shorter than in *Petrophora*.... *Glaucopteryx*.
 Species smaller than in *Glaucopteryx*; palpi long and slender; wings with many lines.... *Phomyria*.
 Wings short and broad; front of head very full and convex..... *Epirrha*.
 Differs from *Petrophora* in venation; first three intercostal venules much shorter than in *Petrophora*..... *Thera*.
 Wings large and squarish, oblong; apex very obtuse; fore wings with smoky bands..... *Hydriomena*.
 Fore wings falcate; head narrow; palpi long; hind wings shorter than in *Glaucopteryx*.... *Petrophora*.
 Antennæ pectinated or ciliated; outer edge of hind wings sometimes bent..... *Ochyria*.
 Antennæ always simple, scarcely ciliated; hind wings not bent, sometimes scalloped; species often black, with white lines and spots..... *Blunnaptera*.
 Head broad; vertex tufted; palpi short; fore wings broad; hind wings produced..... *Antidea*.
 Fore wings large; hind wings small, scalloped; both wings with numerous wavy lines.... *Phobalapteryx*.
 Palpi short; wings with distinct white and dark zigzag lines; hind wings eared and tufted..... *Hydria*.
 Wings acute; palpi long; hind wings eared, scalloped..... *Scolasia*.
 Palpi long; hind wings with very deep scallops..... *Triphosa*.
 Hind wings very small, with a lobe in the male..... *Lobophora*.
 Fore wings narrow, acute, subfalcate; hind wings narrow..... *Carsia*.
 Species entirely black, with a white band; wings short, broad, much rounded at the apex. *Baptia*.
 Hind tibiae swollen; tarsi very short; otherwise like *Baptia* but with metallic scales.... *Halimnata*.
 Antennæ heavily ciliated; palpi very short; fore wings large; hind wings small..... *Heterophleps*.
 Fore tibiae armed with spines; fore wings very long and narrow..... *Lithostege*.

EUPITHECIA Curtis. Plate 1, fig 1.*

Chlorocystis, *Tephroclystia*, *Dysemymatoge*, *Parachia*, *Leucocora*, *Arcyonia*, *Eucymatoge* Hübn., Verz., 323-324, 1818.

Eupithecia Curt., Br. Ins., pl. 64, 1823-40.

Laurentia Treits. (in part), Schm. Eur., vi, 75, 1828.

Eupithecia Steph., Nom. Br. Ins., 44, 1829.

Laurentia Dup. (in part), Lep. France, viii (x), 258, 1830.

* The figures referred to in connection with the genera represent the venation.

- Eupithecia* Boursl., Gen. Ind., 208, 1840;
 H. Sch., Schm. Linn., iii, 112, 1847;
 Steph., List Lep. Br. Mus., 209, 1850;
 Lederer, Verh. B. Z. Ges., Wien, 754, 1853;
 Guén., Phala., ii, 528, 1857;
 Walk., Lep. Brit. Mus., xxiv, 1210, 1862.

Head with a short tuft of scales projecting between the palpi. Antennae strongly ciliated. Palpi long, porrect, extending far beyond the head, sometimes by a distance greater than the length of the head itself; the outer half of the second joint projecting beyond the front; third joint long and slender, half as long as the second joint; the palpus is either rather slender or stout and bushy, the third joint slender and pointed. Fore wings very long and narrow; the costa arched toward the apex, which is produced, subacute, usually more rounded than in *Petrophora*; outer edge very oblique. Hind wings small, short, the apex much produced, the inner edge much shorter than the outer edge, which is rather full. Venation: a single subcostal cell; the two discal venules together form a remarkably straight line, the posterior not being oblique, in this respect differing from all the other genera of the subfamily. The second subcostal venule co-originate with the fifth. Hind legs as usual. Abdomen rather slender, usually slightly crested dorsally and laterally. Coloration: gray, with numerous transverse wavy lines usually present on the hind wings; prominent discal dots, with conspicuous costal spots, and usually a black band at the base of the abdomen.

This extensive genus may be readily determined by the small size of the species, the long narrow fore wings, and by the short hind wings, which are much elongated laterally toward the apex, and by the inner edge of the small hind wings being much shorter than the full convex outer edge.

The different species vary much in form, and considerably in markings. *C. subapicata* has such long wings and unusual style of coloration that I mistook it for a *Chasias*, which it somewhat resembles.

Larva "more or less short; *raide*; keeled on the side, often marked with dorsal *chevrons*, with a small and rounded head; living on trees or low plants".

Pupa "slender, conical, pointed."—Guénée.

Though Hübner's genera have been usually well indicated, in the present genus he entirely failed to establish a natural group, and his names should accordingly fall into the rank of synonyms.

SYNOPSIS OF THE SPECIES.

Atlantic States.

A. Cinereous; discal dot rounded:

- Whitish, with two reddish bands; one basal, the other submarginal. *E. albicapitata*.
 Fore wings rounded at the apex; three large black costal patches; discal dot large, ovate; no distinct angulated extradiscal line *E. absynthiata*.
 Like *E. absynthiata*, but larger, with the wings rather more produced; outer edge slightly sinuous; the lines finer, and discal dot much smaller. *E. zygadeniata*.
 Fore wings pointed, with numerous transverse, fine, wavy, black lines, angulated sharply outward; extradiscal line forming a large right angle opposite the distinct discal dot, with a notch pointed upward on the subcostal vein; a distinct submarginal, wavy, white line ending in large twin spots at the inner angle; five dark lines on hind wings; beneath, heavy black costal spots and marginal lines *E. misculata*.
 Fore wings still more pointed than in *E. misculata*, lineated transversely; beyond the discal spot, the wing dull carneo-cinereous, with the extradiscal line in the middle; a large rectangle opposite the discal dot; palpi long. *E. latata*.
 Form and size of *E. misculata*, but russet-brown; extradiscal brown line curved opposite the discal dot *E. strallonata*.

B. Of large size; whitish; discal dot very linear; wings very long:

- White, with brown bands and patches; costa reddish-brown, interrupted by clear white lines *E. rarocostaliata*.

Pacific States.

A. Of rather small size:

- Like *E. misculata*, but with a decided russet tinge, more distinct lines, the extradiscal less acutely bent, and five lines on hind wings *F. rotundopunctata*.
 Like *E. rotundopunctata*, but nearly twice as large, and with still longer palpi; with similar markings, but smaller linear discal dots *E. longipalpata*.
 Like *E. absynthiata*, but much larger, with the wings much produced, and outer edge sinuous. *F. behrensata*.

B. Of large size, with very long wings:

- Like *E. rarocostaliata*, but more cinereous, with a russet-brown costo-apical patch. *E. nradata*.
 Larger than the others, reddish brown. *E. subapicata*.

EUPITHECIA ALBICAPITATA, n. sp. — Plate 8, fig. 1.

2♂, 1♀.—A rather small species, with large acute palpi; a scutellate area of hairs on the vertex, quite distinct from the similar scutel-shaped front, which rounds to a point more than usual. Palpi very long and large, longer than the head, acute, porrect, dark on the sides, paler above and at the tips. Antennae slender, simple, very minutely ciliated beneath. Prothorax doubly crested, one crest before, one on the posterior edge; the anterior black in the middle. At base of abdomen, an obscure slight reddish band; a dorsal

and lateral row of black dots; a basal, narrow, black, curved line; between this and the mesial black curved line, which dilates very broadly on the costa, and encloses the large, oval, black, discal dot, is a broad reddish band, darker on the costa. Between this and the mesial band is a linear dark line. Beyond is a broad whitish band, interrupted by three black, obscure, broken rows of black scales, bounded by a black line, which is oblique on the costa, going from within outward. Beyond this is a broad reddish band, limited externally by the usual waved white line, which is bordered within with blackish, with two geminate, black spots in the middle, and two others on the inner angle of the wing; edge black; fringe pale, darker at the base. Hind wings with five dark lines; discal dot distinct. Beneath pale cinereous, with one inner and two outer narrow, diffuse, dusky lines; costa dusky; discal dots very distinct; wings more produced than usual.

Length of body, 0.30; fore wing, 0.36; expanse of wings, 0.75 inch.

This small species may be readily recognized by the two pairs of geminate, dark spots on the outer edge, the two broad reddish fasciæ, and the white head and white ground-color, and by the two reddish diffuse bands and large discal dot.

Quebec, Canada (Bélanger); Brunswick, Me., June, not uncommon (Packard).

EUPITHECIA ABSYNTHIATA Linnaeus. Plate 8, figs. 2, 3.

"*Geometra absynthiata* Linn., Fauna Suec., 339, 1761."

"Hübner, Schum. Eur., 453, 1796."

"*Dysmatoge absynthiata* Hübner, Verz., 324, 1818."

Larentia minutata Treits., vi, 195; Suppl., 213, 1828.

"*Eupithecia notata* Steph. Ill. Hans., iii, 286, 1831."

Eupithecia minutata Bours., Gen. Ind., 211, 1849.

Eupithecia conglobata Guen., Planch., ii, 339, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1241, 1862.

Eupithecia geminata Pack., Fifth Rep. Peab. Acad. Sci., 58, 1873.

4 ♂ and 4 ♀.—Wings well rounded at the apex, much more so than usual. Palpi large and stout. Body and wings uniformly rather pale cinereous; wings very free from the usual lines; four costal dots, larger than the others, the outer one forming a large dark triangle, the third an oblique line connecting with the discal dot, which is large and very distinct, black; an inner one consisting of a few minute, black, fine dots. A fine, wavy, scalloped, submarginal, pale line, often interrupted, and forming a row of dots. Edge of wing with very narrow, black, intervenular lines; fringe pale dusky

cinereous, like the wings, with black spots on the base of fringe on the ends of the veinlets; a quite distinct geminate white dot on the inner angle of the fore wings, being the last of a series of submarginal dots, not forming a continuous wavy line as in *E. miserulata*. Hind wings with wavy, acute, zigzag, pale and cinereous lines on the outer edge; discal dot distinct; edge and fringe otherwise as in fore wings. Beneath, these markings are repeated, with the addition of quite a distinct submarginal dusky line common to both wings. Abdomen with a broad black band near the base.

Length of body, 0.30–0.34; length of fore wing, ♂, 0.38, ♀, 0.45–0.50; expanse of wings, 0.70–1.00 inch.

London, Canada (Saunders). Maine, July 8–24 (Packard); Boston, Mass. (Harris Coll., Sanborn, Stratton, and Morrison).

This common species is easily known by the twin dots on the inner angle and the large triangular costal dot; by the indistinctness of the usual lines; by the large costal dark spots; and by the rounded wings.

In the female, the wings are more acute and larger, and the fringe shorter, than in the male. In a large female from Boston, the lines are unusually heavy; seven of them being traceable, exclusive of the submarginal white line. The black costal spots are also conspicuous.

Upon comparing two European examples with those from the Eastern States, I am unable to find any differences that I can put into words, or that would amount to varietal differences. The European ones are a little tinged with russet, and the submarginal white line is more interrupted. The New England examples vary more among themselves than some of them do from the European examples received from the Vienna Imperial Museum. Its range in Europe is said by Standinger (*Catalog*) to be Central and Northern Europe, Middle Lapland, and Sicily. It is doubtfully regarded as an inhabitant of the polar regions of Europe. According to Newman (Ill. Nat. Hist. Brit. Moths), it is common in England, and occurs in Scotland and Ireland. As species of *Petrophora*, *Ochyria*, and *Hydria*, &c., are common to the two continents, it is natural that some species of *Eupithecia* should be found to be circumboreal. It agrees well with Guenée's description. There is, however, no reddish tinge in any specimens I have yet observed.

Larva.—Mr. Crewe has written thus of the caterpillar: "It would be impossible to give an accurate description of the almost endless varieties of this most variable caterpillar. They run so closely into each other that it

would be an almost herculean task to separate them. The ground-color is either deep rose-color or dirty reddish-brown, with a series of reddish lozenge-shaped spots down the center of the back, generally becoming faint or confluent toward the head or tail. In the green variety, these spots are often entirely wanting; on each side is a number of narrow, slanting, yellow stripes, forming a sort of border to the dorsal spots; spiracular line waved, yellow; body wrinkled, thickly studded with minute white tubercles, and somewhat more sparingly with short white hairs; segmental divisions yellow; it is thick and stumpy, tapering but little. It feeds, from the end of August to the beginning of November, on the flowers of the common yellow and hoary-leaved ragwort (*Senecio jacobaea* and *S. crucifolius*), on the hemp-agrimony (*Eupatorium cannabinum*), the mugwort (*Artemisia vulgaris*), the yarrow (*Achillea millefolium*), the golden-rod (*Solidago virgaurea*), and other plants. The chrysalis, which is inclosed in a tightly-spun earthen cocoon, has the wing-cases bright-green, the rays very prominent, the thorax yellowish-green, and the body reddish-yellow, with a dark-green dorsal line."—*Newman's British Moths*, 136.

EUPITHECIA ZYGADENIATA, *n. sp.* Plate 2, fig. 7.

2 ♀.—A little lighter in hue than *E. absynthiata*; similar to that species in form, but the body is much stouter, with the wings much more produced toward the apex, which is much less rounded than in *absynthiata*; while the outer edge of the wing is sinuous, that of *absynthiata* being full. Palpi rather longer and larger than in that species. Fore wings crossed by about ten slight, wavy, dark lines, bent outward a little below the costa; the lines become more oblique beyond the discal dot; the line situated half way between the discal dot and the edge of the wing is curved inward between the costal edge and the last subcostal vein. The usual submarginal white line is present, but the white spot on the inner edge is slightly marked. The discal dot is much smaller and more linear than in *absynthiata*. The hind wings are much as in that species, but the lines are much finer and narrower; beneath of the same tint as above, with the lines feebly reproduced, the most conspicuous line being the one situated midway between the discal dot and the outer edge of the wing. There are several dark spots on the costa.

Length of body, ♀, 0.45; of fore wings, ♂, 0.50; expanse of wings, 1.00 inch.

Bozque County, Texas, March 23-24 (Beltrager).

Larva.—Mr. Belfrage, who has reared the moth from the caterpillar (figured on one of the plates), and has sent me specimens alive, tells me that it feeds on *Zygadenus nuttallii* Gray (kindly identified by Mr. S. Watson). He says: "The larva is flesh-colored, with dark spots, and feeds on the flowers. It is gregarious, and appears during the flowering of the plant, viz. late in April and beginning of May, at the end of which time it transforms to a reddish-brown pupa, which is not hatched before the next year, about the time when the plant commences to flower, or shortly before. It is not rare."

In living specimens received from Mr. Belfrage, the body is very broad, thick, somewhat flattened; the ground-color yellowish-orange, including the head, which is immaculate. There is a dorsal and two lateral rows of large, conspicuous, black blotches, the lower lateral row not seen from above. Beneath is a row of small median black dots.

Length, 0.60 inch.

EUPITHECIA MISERULATA Grote. Plate 8, figs. 4, 5.

Epithecia miserulata Grote, Proc. Ent. Soc. Phil., ii, 32, pl. 2, fig. 4, 1863.

Epithecia interrupto-fasciata Pack., Fifth Rep. Peab. Acad. Sc., 59, 1873.

6 ♂, 6 ♀.—Head and body cinereous; anterior edge of front with blackish scales along the orbits. Palpi rather long, scarcely so large as in *E. absynthiata*, whitish above, dark on the sides. Antennæ finely ciliated beneath, above minutely annulated with black. Thorax cinereous, uniformly concolorous with the wings; a transverse black band in front, ending on the patagia. Fore wings uniformly cinereous, with indistinct lines or bands; on the outer third, beyond the discal spot, russet-brown between the veinlets. Veinlets dotted with black scales; on the costa, three dark, indistinct spots within and two beyond the discal spot, the two outer ones being the largest, and sending faint lines across the wings, all bent outward at right angles below the costa. Discal dot large, distinct, black; beyond is a broad transverse area, where the veinlets are dotted more thickly with black scales than elsewhere; bounded beyond by a wavy, doubled, elbowed line, extending from costa to median vein; between the angle and the costa the line is bent inward on the subcostal vein; submarginal whitish line very narrow, more zigzag and linear than usual, often interrupted, consisting of intervenular dots, edged externally with dark scales. A geminate white dot on internal angle, very distinct, forming a V, with the lower dot much smaller than the upper. Fringe long, cinereous, interrupted with dusky on the end of the veinlets. Hind wings with

a round, small, but distinct discal dot; an indistinct submarginal band; five dark bands on the inner edge, which do not pass beyond the median vein. Margin of wings uniformly dusky, without any light or dark scales. On second ring of abdomen, a broad black band, interrupted by a pale, mesial, white, narrow band, which extends along six rings, with a mesial black dot on each ring. Sides of abdomen with brownish scales; extreme tip pale luteous. Margin of both wings black; fringe as in fore wings; beneath clear cinereous, with no brown scales; the broad costal dark bands inclosing two much smaller bands; a short line half-way between discal dot and outer edge of wing. Margin of both wings dusky, containing a white hair-line; fringe paler than margin of wing. Hind wings with five dusky lines, two within the discal dot (sometimes wanting); the third, including the dot, very narrow; the two outer ones broader, especially the submarginal one, which reaches to the edge.

Length of body, 0.20; length of fore wing, 0.30; expanse of wings, 0.85 inch.

London, Canada (Saunders); Norway, Me., common (S. I. Smith, Mus. Comp. Zoöl.); Boston, Mass. (Harris Coll., Sanborn, Morrison); Nantucket, Mass., August (L. L. Thaxter, Mus. B. S. N. H.); Catskill Mountains, New York (Mus. Comp. Zoöl.); Albany, N. Y. (Lintner); Pennsylvania (Mus. Comp. Zoöl., Amer. Ent. Soc.); Ohio (Morrison); Missouri (Riley, No. 40); West Virginia, April 9 (Mead); near Waco, Tex., June 6, October, November (Belfrage).

Differs from *E. Strattonata*, to which it is rather closely allied, by the wings being more cinereous, and beneath with no brown scales at all; by the geminate white V-shaped spot on the inner angle, and the five lines on the under side of the hind wings, which only appear on the inner edge above; by the interrupted black band on the second abdominal ring, and the white line on six rings, each ring clouded by a black dot; and by the very pale luteous, straight, converging hairs of the extremity.

This is our most common species, and may be distinguished by the pointed fore wings, with the numerous transverse lines angulated sharply outward, the extra-discal line forming a sharp angle opposite the discal dot, and notched inward on the subcostal vein; by the distinct submarginal wavy white line ending in a large white twin spot at the inner angle; by the fine dark lines on the hind wings; and by the heavy black costal spots and marginal lines on the under side.

Though Grote's *miserculata* was evidently described and figured from a rubbed example, I am now inclined to regard my *interrupto-fasciata* as a synonym of it. It is very closely allied to the European *E. innotata* Hfn., but the wings are less produced toward the apex, and, consequently, the lines are less oblique; but their arrangement is almost identical, so much so that I am half inclined to regard our species as a climatic variety of the European form. It is much like *E. arcuata* Boisd., but wants the inward subcostal bend, so well marked in *E. innotata*. The twin white spot on the inner angle is larger and heavier in our species than in *E. innotata*.

In two females from Texas, the markings are more distinct than above described, and there is an obscure submarginal row of white dots on the hind wings. From *E. absynthiata* it differs in the longer wings, and the presence of lines in the middle of the fore wings, while the discal dots are smaller.

It is still possible that my *E. interrupto-fasciata* is distinct from Grote's *miserculata*, of which I have seen types; but it can only be decided by better specimens than I have been able to get together. Should they be distinct, *interrupto-fasciata* may be retained for the specimens with rather blunt fore wings and distinct angulated lines, with black streaks running inward on the veins from the extradiscal line.

I have received from Mr. Behrens, of California, three well-preserved specimens, which scarcely differ from the immaculate variety of this species, sometimes occurring in the Atlantic States. They are males, with the fore wings narrow and much pointed. The usual lines are only represented by slight costal spots; the submarginal white line is very faint, as well as the twin spot at the inner angle. The hind wings are well rounded at the apex. The fore wings are deep ash-brown, with a fawn-colored tinge along the costa and the veins. The hind wings are without markings and whitish, except on the inner edge; but beneath are two rows of black dots, less diffuse than in eastern specimens.

I have specimens from the town of Ohio, Ill. (Morrison), (see pl. 8, fig. 5), and have others from Norway, Me. (M. C. Z.), in which the wings are shorter and the apex squarer than usual, with the lines very distinct, the discal dots on both wings heavy, and with a distinct, dark shade on the outer third of the wing, with a waved whitish hair-line passing through the middle, while beneath the dots and lines and shades are very heavy. The wings expand 0.66 inch. I am at present inclined to regard this as a variety of *miserculata*, though it may prove to be distinct. It is possibly Walker's *E. implicata*.

Larva.—Of the characteristic form, being rather thick in the middle; the body seen dorsally decreasing in thickness from the tail to the head. Supra-anal plate large, triangular, not acutely pointed, deep red, white on the edges. Head small, not so wide as prothoracic ring, pea-green, color of the leaves on which it feeds; dorsal line dark-green; subdorsal white, and a wider lateral white line. Segments transversely wrinkled. Body provided with short, black, scattered hairs.

Length, 0.50 inch.

Food-plant, juniper (*Taxus baccata* Linn.).

Pupa.—On June 4, the larva began to spin, the pupa being inclosed in a slight white cocoon. In the body of the pupa are four segments beyond the end of wings (in *Chora pulcherrima* six), of the usual family-form; thorax and under side of wings and limbs with a greenish tinge; rest of body pale horn-brown, as usual. Head full, convex between the eyes. End of abdomen with a long rounded spine, with three pairs of long hairs, curved outwards at end.

Length, 0.28 inch.

I am indebted to Mr. S. E. Cassino for the discovery of this larva near Salem, Mass., which he reared and drew. The moth had the wings imperfectly developed, but I think that it is, without much doubt, this species.

EUPITHECIA ROTUNDOPUNCTATA Packard. Plate 8, fig. 6.

Eupithecia rotundopunctata Pack., Proc. Bost. S. N. H., xiii, 395, 1871.

3 ♂, 3 ♀.—This species is of the more usual form, and very closely resembles *E. miserulata*. The palpi long, slender, reaching far beyond the head. General color pale russet-brown. Head, palpi, and body like the wings. Fore wings covered with wavy brownish lines, dull whitish between. Discal dot large and round. Just beyond the discal dot, there is a clearer band, consisting of two double lines, which are directed obliquely inward and downward toward the discal dot, and are then suddenly curved outward opposite the discal dot; below the curve is a series of black dots and streaks inside the band, succeeded by a more dusky band, widening on the costa, and lined externally at intervals with whitish; a distinct slightly-waved line, ending in two larger white spots at the internal angle; at base of fringe, a row of intervening, deep-brown, linear spots; fringe concolorous with the rest of the wing, checkered with black on the basal half. Hind wings clear in middle and on costa;

a submarginal, zigzag, brown line, and marginal row of intervenular linear spots on the submedian space and inner edge; five lines only extending as far as the median vein. Beneath, the dusky discal dot and band and submarginal white line is distinct; wings checkered on the costa, with a submarginal dusky band; a marginal row of intervenular linear spots, and a dusky spot on the fringe opposite the end of each venule; hind wings with five well-marked lines, two beyond the discal dot.

Length of body, ♂ 0.30; fore wing, ♂, 0.40–0.50; expanse of wings, 0.75–0.95 inch.

California (Edwards); Sanzálito, February 26 (Behrens).

It is allied to *E. miserulata*, but the wings are more russet-brown, and the lines are more distinct; the extra-discal line is curved farther from the costa, and the lines on the hind wings are much more distinct. It seems to be the most common species in California, as abundant as our *E. miserulata*. The submarginal line should be represented on the plate as waved.

EUPITHECIA LONGIPALPATA, *sp. n.* Plate 9, fig. 6.

2 ♂.—Palpi very long, much longer than in an undescribed species closely allied to this; extending by a distance beyond the head greater than the length of the latter; third joint long and slender, acute. Fore wings long, the apex produced, but elongated; outer edge very oblique; hind wings more pointed toward the apex than usual. The moth is much of the form of *rotundopunctata*, but nearly twice as large, while the hind wings are more acute. The color and markings are much as in that species. The fore wing is crossed by about ten wavy black lines, but two double dark lines (sending a slender point out into the discal space), situated half-way between the base of the wing and the extradiscal prominent wavy line, are the most prominent lines. This last line is bent sharply below the costa, and is followed by a clear space. Half-way between the clear space and the edge of the wing is a submarginal row of white dots, with a large V-shaped spot on the inner angle. A marginal interrupted black line. Fringe pale-ash, checkered distinctly. Hind wings with four well-marked wavy black lines, and a submarginal row of white spots. Discal dots much smaller, more linear than in *rotundopunctata*; larger on the under side of the wings. Beneath both wings paler than above, with an intra- and extra-discal broad blackish band, and on the fore wings the margin of the wing is broadly shaded with blackish. On the

hind wings, there are two extra-discal lines, but the edge of the wing is clear, with a black interrupted marginal line. Abdomen long and slender, with a black band at base and a lateral linear black stripe.

Length of body, ℓ , 0.45; of fore wings, ℓ , 0.52; expanse of wings, 1.05 inches.

Mendocino, Cal. (Behrens).

Somewhat like *E. rotundopunctata* in its shape and style of markings, but with more acute hind wings, and nearly twice as large.

EUPHRECIA LUTEATA Packard. Plate 8, fig. 7.

Euphrecia luteata Pack., Proc. Bost. Soc. Nat. Hist., xi, 46, 1867.

Euphrecia palpata Pack., Fifth Rep. Peab. Acad. Sci., 58, 1873.

2 ℓ , 1 \varnothing .—Fore wings long, more pointed than in *E. miserulata*. Palpi unusually large and stout, broad at base, acute, extending out farther than the width of the head; dark gray, with light scales; tips luteous. Head dark gray; front edge black. Fore wings crossed by three blackish lines, very regularly curved and parallel to each other, represented on the hind edge by a black dot on the costa; the wing, in the middle and along the hind edge, somewhat luteous; a broad, luteous, extra-discal space, with black speckles and strigae on the veins; a submarginal row of white dots, shaded within with black, ending in the usual geminate white dot; edge of wing black. Fringe very long, luteous, cinereous, interrupted by broad, dark, square patches at the end of the veins. Hind wings with four obscure dark lines, the second inclosing the discal dot; discal dot black, distinct, edge black. Fringe as on fore wings. Abdomen cinereous, with black scales; a black line on each side; tip squarely truncated, though longer than broad, with long, straight, blackish scales. Beneath, pale-ashen, with two outer black lines, and on hind wing four dark lines; fringe with smaller dusky spots than above. Abdomen pale beneath. Legs pale, uniform with the body and wings.

Length of body, 0.35–0.38; fore wing, 0.40–0.43; expanse of wings, 0.85 inch.

Caribou Island, Straits of Belle Isle, Labrador, July 14, 1860 (Packard); Brunswick, Me. (Packard); West Farms, N. Y. (Angus); Albany, N. Y. (Lintner).

This is not a common species. It may be readily recognized, as it differs in the much-pointed wings; the large, stout, acute, black palpi; the four regu-

larly-curved parallel black lines on both wings, seen more distinctly beneath; and by the broad, clear, flesh-yellow, or luteous band between the discal dot and the extra-discal line.

The Labrador specimen does not differ from those from Maine and Massachusetts, except that it is rather larger. (Length of body, 0.35; fore wing, 0.42 inch.)

The following is a description of the Labrador example:

More luteous on the fore wings than usual. Palpi rather stout; hairs scarcely as long as usual; front dark cinereous. Fore wings cinereous, with darker scales, especially on the costa and toward the apex; the base of the wing is crossed by dark diffuse lines; discal dot larger, more diffuse than usual; beyond is a broad luteous band, very diffuse and irregular, but free from dark scales, and still beyond is a submarginal, diffuse, blackish band; fringe as usual. Secondaries with a dusky discal spot; edge of ring black; fringe long, cinereous, interrupted by narrow dusky spots; inner margin of the wing with blackish scales, gathered just beyond the discal dot into a faint diffuse line, disappearing toward the middle of the wing.

Length of body, 0.35; of fore wing, 0.42; expanse of wings, 0.85 inch. Caribou Island, Straits of Belle Isle, July 14, 1860.

This species is much larger than several allied forms from Maine, and the discal dot is more diffuse and larger, the space beyond luteous, more clear from dark scales, while the anterior two-thirds of the hind wings are clearer. Beneath, the discal dot is distinct, on the fore wings being black, linear, with an outer slightly sinuate line; a little dusky on the costa and outer edge. On the hind wings, a dusky line, more distinct than above. Legs pale, as usual.

EUPITHECIA STRATTONATA Packard. Plate 8, fig. 8.

Eupithecia Strattonata Pack., Fifth Rep. Peab. Acad. Sci., 60, 1873.

1 ♀.—Fore wings acutely produced, less so than in *E. luteata*; outer margin quite oblique. Head and palpi dark-cinereous; palpi acute, extreme tip pale; thorax covered with brownish scales; abdomen banded with pale-ashen, the broadest band on the basal joint. Fore wings light russet-brown, with brownish-ochreous scales; costal margin rusty-cinereous, with five blackish spots, each sending an obscure russet-brown line across the wing, the extra-discal one being most distinct, and regularly curved opposite the discal dot;

beyond is a broad, diffuse, submarginal, russet-brown band; the one just before the discal dot largest, square. Middle and outer margin of the wing brownish; a submarginal, pale, obscure line; a few black strigae and dots on the median and internal veins on basal half of the wing; and a short row of black venular dots just beyond the discal dot, which is very distinct, on a cinereous ground. Margin of wing black; fringe long, dusky, with intervenular black linear spots. Hind wings cinereous, with black speckles at base, outer third brownish; a short, wavy, whitish, geminate line, becoming obsolete toward the middle of the wing, with a single pale dot on the inner angle; no discal dot. Beneath brownish, especially externally; discal dot very distinct, small on hind wings; an extra-discal narrow band and a marginal broad brown band common to both wings.

Length of body, 0.28; length of fore wing, 0.38; expanse of wings, 0.82 inch.

Natick, Mass., July 17 (Stratton).

This is not a common species, but one example having as yet occurred. It may be known by the rusty-brown wings, an outer, pale, curved line, including black dots; by the costa being paler, with five black spots; and by the want of the usual zigzag, waved, pale, and dark lines, the extra-discal line being regularly curved opposite the discal dot.

EUPITHECIA BEHRENSATA, *sp. n.* Plate 9, fig. 5.

1 ♂.—A very large species. Head, body, and wings of a uniform gray ash-color, being of much the hue of *E. absynthiata*; without the usual lines and markings, being the most clear gray species yet known from California. Both wings very much elongated toward the apex, being narrow, oval, and rather more pointed than in *E. sabapicata*. Fore wings with a prominent, sublinear, rather thick, black, discal dot. No costal spots. Two very faint, narrow, intra-discal lines, very oblique below the costa. Beyond the discal spot are traces of four very oblique, black, parallel lines, and of a submarginal, white, wavy line, with a bent, white, narrow spot near the inner angle. A faint discal line, and traces of the beginnings of two or three lines, on the hind wings. On the second segment of the abdomen is a prominent black band, and there is a dorsal and lateral row of black dots. The under side of the wings exactly as the upper, except that the discal dots are much smaller, and there are no traces of lines.

Length of body, ♂, 0.42; of fore wings, ♂, 0.60; expanse of wings, 1.20 inches.

Sanzalito, Cal., April (J. Behrens).

I take pleasure in dedicating this fine species to Mr. James Behrens, its discoverer. It is one of the largest of the genus, and may be recognized by its large size and the pointed wings, the outer edge of the wings being sinuous; also by the absence of the usual markings. It is but little rubbed, and so well marked that I venture to describe it. There is no species in the Eastern States like it.

EUPITHECIA RAVOCOSTALIATA, *sp. n.* Plate 8, fig. 9.

1 ♀.—This exceedingly pretty species is, in form and size, intermediate between *E. miserulata* and *subapicata*. Like *E. nevadata*, the head is very prominent, the wings very long and subacute, the outer edge of the fore wings being very oblique. The palpi are very short and thick, broad; the third joint very short, minute, and passing but slightly beyond the front. Head and thorax white; palpi and front edge of the head dark tan-brown. Wings whitish-ash. Costa of fore wings dark russet-brown, almost tan-color, interrupted by fine white spots, the widest one being beyond the discal dot, while the one over the discal spot is very faint. The discal spot is black and linear, oval. The middle of the wing is whitish. There are faint traces of transverse lines, more distinct on the inner submedian region of the wing, which is tinged irregularly with russet-brown, with wavy, transverse lines. On the bases of the median branches are fine tan-brown streaks and dots. A double, white, extra-discal, wavy, somewhat interrupted line is bent outward below the costa, and sends a pointed scallop inward on the second and third median venules, and again on the internal vein; beyond, a broad, interrupted, russet-brown band, beyond which is a wavy, distinct, submarginal, white line, beginning on the costa midway between the apex and the extra-discal costal spot (the beginning of the extra-discal line). Hind wings white on the costal half; behind ash-colored, with four fine, wavy, white lines, the fourth (and submarginal) being distinct and sharply zigzag. Marginal white line interrupted by white dots. Fringe on both wings long, whitish-ash, with a broad, basal, smoky line, and checkered with smoky-ash; beneath whitish, with more regular lines than above. Costa dull smoke-gray, interrupted by dull white spots. The four discal dots large, black, very distinct; several obsolete trans-

verse lines, and a submarginal, broad, smoke-gray band, filling up the scallops of the submarginal white line. On the under side of the hind wings, which are white, are four well-marked lines, two within and two beyond the large round discal dot; the two outer lines are deeply scalloped, the points long and parallel; the marginal line of round or triangular dots is very distinct. Abdomen brown. Legs brown, spotted with white.

Length of body, ♀, 0.32; of fore wing, ♀, 0.46; expanse of wings, 1.00 inch.

Norway, Me. (S. I. Smith, Mus. Comp. Zool.).

One of the best-marked species of the genus. It is separated from the others by the long wings, short obtuse palpi, the white head and thorax, and the deep-russet or tan-brown costal edge of the fore wings, interrupted by white spots, and contrasting with the white surface of the wing; and by the multilined hind wings.

EUPITHECIA NEVADATA Packard. Plate 8, fig. 10.

Eupithecia nevadata Pack., Proc. Bost. S. N. H., xiii, 395, 1871; xvi, pl. 4, fig. 2, 1874.

4 ♂, 2 ♀.—In this pretty species, the wings are much longer than usual; the outer edge being very oblique, the head very prominent, the prothorax being rather long, and the palpi rather short, very broad, passing beyond the front by a distance equal to that between the base of the antennæ; while, in the species previously described, the palpi surpass the front by a distance equal to the length of the head itself. They are black, with a few white scales along the middle of the side; front edge of front blackish; front itself and vertex whitish; thorax whitish, with a few black scales. Fore wings pale-gray. Base of costa dark tan-brown, terminating abruptly in a slightly-curved black line, ending in the middle of the median space; costa throughout dark reddish-brown, interrupted by four white spaces. Just before the middle of the wing is an oblique blackish band, directed outward and passing below the subcostal vein. Just above the raised discal dot is a square, dark-reddish, costal patch, succeeded by two white, short lines. Half-way between these and the apex are two twin white costal bands, with a broad, dark-red patch on each side. Beyond is a squarish, reddish-brown patch, and the extreme apex is gray. The base of the wing below the costa is quite clear, with scattered dark scales, and a black linear spot on the end of the median vein at the origin of its branches. From this spot, a linear reddish line extends to the discal dot.

and below two dusky lines extend to the inner edge of wing, the inner being the wider. The discal dot is curvilinear, black, very distinct, edged with white externally, and raised, forming a high crest. A few red scales are scattered over the space inside the discal dot. Beyond the discal dot is a broad, clear, pale-gray band, with a row of longitudinal, black, linear spots on the outer edge, becoming longer toward the costal edge of the wing. This broad space terminates on the subcostal vein: it is limited on the outer edge by a wavy, light line. Beyond is a row of reddish, diffuse patches, forming a wide series of scallops. The outer edge of the wing is dusky-gray: along the base of the fringe is a linear, narrow, black line, interrupted by the ends of the venules. The long fringe is dirty-white, with slightly darker scales. Hind wings clear on the costal and median areas, with a distinct, round, discal dot; the inner and submedian region covered with dark and light alternating, crinkled lines, most marked on the venules. Beneath, fore wings clear, with costa dusky at base; discal dot distinct, linear, extending nearly to the costa. Half-way between it and a subapical black patch is a black line consisting of two dots. Beyond the discal dot both wings are lineated finely with black and gray, and the black line at base of fringe is very distinct.

Length of body, 0.40; fore wing, 0.50; expanse of wings, 1.05 inches.

Nevada (Edwards); Sanzálito, Cal., February 14, 26 (Behrens).

This beautiful form may be recognized by the whitish-ash wings, with russet-brown mixed with dark-ash bands and patches, and the russet-brown costo-apical patches. It is closely allied structurally to *E. ravocostaliata*.

EUPITHECIA SUBAPICATA Guenée. Plate 8, fig. 11.

Eupithecia subapicata Guen., Phal., ii, 331, 1857.

Chesias occidentaliata Pack., Proc. Bost. S. N. H., xiii, 404, 1871.

16 ♂ and ♀.—The fore wings are lanceolate-oval; the outer edge of the wing being very long and oblique, and as long as the inner edge of the wing. It is russet-brown, the vertex being considerably paler than the front of the head and palpi. The male antennæ are finely ciliated beneath. Fore wings russet-brown, with dark scales along the veins and their branches. No distinct markings or transverse stripes except a pale, whitish, slightly zigzag, marginal line, most distinct near the inner edge of the wing, and near the apex touching on the outer end of a large, conspicuous, oblique, ochreous-white patch. The discal dot is large, round, black, distinct. Along the costa are faint-brown spots, especially above the discal dot, where four of them are slightly marked.

Hind wings clear russet-ash, paler than the fore wings, but dusky along the inner edge, with three short, wavy lines, one at the inner angle, the other two approximate and nearer the middle of the inner edge. A pale line along the middle of the abdomen, interrupted by black dots; a similar stripe runs along each side.

Length of body, 0.42; fore wing, 0.54; expanse of wings, 1.12 inches.

California (Edwards): San Mateo, Cal. (A. Agassiz, Mus. Comp. Zool.); Sanzálito, Cal., February 11, March 21, April 7-17 (Behrens).

This seems to be a common species. It may be known by its large size, the peculiar color, like old unpainted oak-wood, with light slashes, and a distinct marginal line. I confess I mistook it for a *Chasias*. On sending a specimen to M. Guenée, he informs me that it is his *E. sabupicata*. Professor Zeller has also determined it to be that species from specimens I sent him.

EUPETHECIA CRETACEATA Packard. Plate 8, fig. 15.

Larvula cretacea Pack., Sixth Rep. Penb. Acad. Sci., 10, 1-74; Proc. Bost. S. N. H., xvi, pl. 1, fig. 3, 1-74.

3 ♂ and 3 ♀.—Fore wings very long, pointed. Hind wings more rounded than in *E. zygadeniata*, chalky white throughout, with numerous partially obsolete, wavy, ashen lines on the middle of the wing, but distinct on the costa; an oblique row of dark dots just beyond the middle of the wing, the row following a straight course. Hind wings marked as on anterior pair, with numerous ashen, obscure, parallel, wavy lines. Beneath whitish, shining with a smoky tinge, especially on the fore wings, with numerous wavy ashen lines. Discal dots small, but distinct; a narrow, interrupted, black line along the edge; fringe whitish, dirty-white externally. Fore legs dusky-whitish. Hind legs whitish, broadly ringed with dusky-ash.

Length of body, ♂, 0.45, ♀, 0.43; fore wings, ♂, 0.60, ♀, 0.60-0.68; expanse of wings, 1.15-1.25 inches.

Sides of Mount Washington, New Hampshire, July 7 (Sanborn, Mus. Bost. Soc. Nat. Hist.); Sierra Nevada (Edwards).

This is the largest species of the genus, and may be recognized by its large size, the chalky-white color, and the heavy, dark, conspicuous costal spots. It is allied in structure and venation to *E. zygadeniata*, but differs in the much shorter palpi.

The Californian specimens have longer, more acute fore wings than those from New Hampshire.

Desiderata.*

Eupithecia anticaria Walk., Lep. Het. Br. Mus., xxiv, 1241, 1862 —
 “*Female*: Cinereous fawn-color. Palpi short. Abdomen cinereous, with fawn-colored bands. Wings narrow, elongated, with brownish lines, which are partly denticulated; marginal points blackish, elongated. Fore wings acute, partly cinereous; discal mark blackish, transverse, varying in size; exterior border very oblique. Hind wings cinereous, with the lines most distinct toward the interior border.

“Length of the body, 3 lines; of the wings, 10 lines.

“*a, b*, Nova Scotia. From Lieutenant Redman’s collection.”

Eupithecia implicata Walk., Lep. Het. Br. Mus., xxiv, 1241, 1862.—
 “*Female*: Brownish-cinereous. Palpi shorter than the breadth of the head. Wings narrow, elongate, with many brown, slightly undulating lines; marginal space brownish, including the pale, cinereous, denticulated, submarginal line; marginal line dark-brown; discal point blackish, most distinct in the hind wings. Fore wings slightly acute; exterior border very oblique. Hind wings somewhat paler than the fore wings, except toward the exterior border.

“Length of the body, 3 lines; of the wings, 10 lines.

“*a, b*, Saint Martin’s Falls, Albany River, Hudson’s Bay. Presented by Dr. Barnston.

“*c, h*, Nova Scotia. From Lieutenant Redman’s collection.”

Eupithecia explanata Walk., Lep. Het. Br. Mus., xxiv, 1242, 1862.—
 “*Female*: Cinereous. Palpi short. Abdomen slightly crested. Wings narrow, elongate, with elongated, black, marginal lunules. Fore wings acute, fawn-color, with several brown, slightly-undulating lines, and with two slight whitish bands; submarginal line whitish, denticulated; discal mark black, transverse, rather large; exterior border very oblique.

“Length of the body, 3 lines; of the wings, 10 lines.

“*a, d*, Nova Scotia. From Lieutenant Redman’s collection.”

Eupithecia gelidata Möschler, Wien. Ent. Monats., iv, 47, 1860.—“Herr Professor Zeller bestimmte mir diese Art als neu und ist sie auch mit keiner

* Under the head of “*Desiderata*” are given copies of descriptions of species not seen by me, which are supposed, in most cases, to be valid. In the case of the three present species described by Mr. Walker, I was unable to find the types in the British Museum in 1872. I have since then received drawings of *E. implicata* and *E. explanata*, made under the directions of Mr. A. G. Butler, but the identifications are still very doubtful.

der mir bekannten Arten zu verwechseln. Ich besitze nur ein weibliches Exemplar, welchem die Hinterflügel verküppelt sind.—Flügel-Spannung 21 Millim. Breite eines Vorderflügels 4–5 Millim. Fühler bräunlich; Kopf, Thorax und der Hinterleib braungrau. Brust weissgrau; Stirne mit eingemengten grauen Schuppen. Füsse bräunlich weisslichgrau beschuppt.

Die Grundfarbe der Flügel auf der Oberseite ist ein in Grau ziehendes Braun; auf den Vorderflügeln stehen vier dunkle braungraue Querstreifen. Der erste, nahe der Wurzel, ist scharf nach aussen gebogen, saumwärts am Vorderrande weissgrau angelegt; der zweite bildet nahe dem Vorderrande einen stumpfen Winkel und verläuft weit wurzelwärts gezogen in den Innenrand; nach innen ist er weissgrau angelegt. Der dritte bildet in gleicher Richtung mit dem zweiten nach aussen einen Winkel und zieht dann, weniger schräg wie jener, in einigen Bogen zum Innenrande; nach aussen ist er erst durch eine parallele weisslichgraue und dann wieder dunkelbraune Linie begrenzt und erscheint dadurch doppelt, licht getheilt. Der vierte zieht als auf den Rippen feingezackte, am Vorderrande und auf Rippe 2 etwas eingezogene Bogenlinie durch den Flügel; saumwärts begrenzt ihn eine breite weissliche, durch eingemengte feine braune Fleckchen doppelt erscheinende Linie. Die Wellenlinie ist nur fein weiss vom Vorderrande bis auf Rippe 7 sichtbar. Der Vorderrand ist zwischen und vor den Querstreifen weisslich bestäubt. Franzen an der Basis weissgelb; ihre Endhälfte, sowie die Rippen graubraun. Saum schwarzbraun umzogen; in den Zellen sitzen nach innen gleichgetärbte Fleckchen auf. Die Hinterflügel scheinen drei dunkle, licht begrenzte Wellenlinien zu führen. Franzen wie an den Vorderflügeln. Unten sind die Flügel licht gelbgrau; der zweite und dritte Querstreif der Vorderflügel sind als abgebrochene schwarzbraune Striche am Vorderrande sichtbar; letzterer ist zwischen und vor ihnen weissgrau bestäubt; die übrige Zeichnung ist verloschen. Die Hinterflügel sind noch etwas lichter, mit drei gezackten, dunkelbraunen Querstreifen. Die Mittelpunkte aller Flügel sind schärfer, wie auf der Oberseite, etwas langgezogen.

„Einige andere Exemplare einer *Lupithoea* aus Labrador, welche ich erhielt, sind so abgellogen, dass sich nicht bestimmen lässt, ob sie zu obiger Art gehören.“

GLAUCOPTERYX Hübner. Plate 1, fig. 2.

Glaucopteryx Hübner, Verz., 332, 1-18.

Amala Hübner, (in part), 333, 1-18.

Larentia Treits., (in part), Schum. Eur., vi, 75, 1-25.

Steph., (in part), Nom. Br. Ins., 44, 1-29.

Aplocera Steph., (in part), Nomencl. Br. Ins., 44, 1-29; "Cat., ii, 141, 1829."

Larentia Dup., (in part), Lep. France Noct., viii (3), 358, 1830.

Aplocera Steph., Ill., iii, 295, 1-34.

Larentia Boisd., (in part), Gen. Ind., 504, 1-40.

H. Sch., (in part), Schum. Eur., iii, 141, 1-17.

Glaucopteryx Steph., List Lep. Br. Mus., 194, 1-50.

Cidaria Led., (in part), Verb. B. Z. Ges. Wien, 253, 1-53.

Larentia Guen., Phal., ii, 233, 1-57.

Walk., List Lep. Het. Br. Mus., xxiv, 1169, 1-62.

Head full and rounded in front, with no well-marked interpupal tuft. Antennae usually ciliated (in *G. Sabiniaria* with short, fine, spatulate, ciliated pectinations). Palpi broad and long, porrect, extending well in front of the head; third joint small, conical, pointed. Fore wings with the costa straight, a little arched toward the slightly-produced apex; outer edge oblique. Hind wings long, the inner edge much longer than the outer, which is full and rounded, with the apex much rounded. Venation: two large, well-marked, subcostal cells (in *G. Sabiniaria* the inner cell very small); the second subcostal venule arises half-way between the end of the outer cell and the origin of the third subcostal venule; the posterior discal venule bent (not curved) near the middle. Hind legs moderately thick; tarsi slightly shorter than the tibiae (in *G. Sabiniaria* the tarsi are a little longer than the tibiae). Abdomen moderately stout, with a well-marked tuft of hairs at the tip, forming in *G. Sabiniaria* a larger tuft than usual. Coloration: stone-gray, often with golden scales, and with numerous, wavy, zigzag lines. Hind wings lineated or clear.

This genus embraces some of the largest species of the subfamily, and differs from *Eupithecia*, on the one hand, in the large hind wings, with the long inner edge, and from *Phryganea*, on the other, by the full, rounded hind wings. The palpi are stouter and shorter than in *Thera*. The long, subacute fore wings, and the large hind wings extending beyond the end of the abdomen, and the peculiar style of marking, mimicking the colors of lichen-clad rocks, distinguish it.

The species are more liable to be confounded with those of *Petrophora* than any other genus; but they differ in the shorter, stouter, blunter palpi,

straighter costa of fore wings, and rather more oblique outer edge, and the longer hind wings.

The most aberrant species is *G. Sabiniaria*, which, in the pectinated antennae and venation, forms a subgenus, but which I do not think should be separated generically from *G. polata*. Both of these two arctic species differ from the others, even *G. casata*, in the hairy head and body.

Spargania magnoliata of Guenée is very closely allied to *G. polata* in structure as well as in its peculiar style of markings, and the genus is evidently a synonym of the present one.

Larva.—The body is of equal thickness from the head to the end. Head much rounded, not so wide as the body. Supra-anal plate sometimes rounded posteriorly. Feeds on species of *Vaccinium*, spinning a slight cocoon among the leaves of its food-plant. It hibernates, pupating late in the spring.

Synopsis of the Species.

A. ♂ antennae simple:

- Larger than the other species. Fore wings with convex costa; a double, wavy, extra-discal line, bent below the costa, and a more distinct, whitish, submarginal line. Olive-gray, with numerous, scattered, golden scales *G. casata*.
Costa straighter than in *G. casata*. Steel whitish-grayish, with about twelve wavy lines; hind wings flesh-colored *G. magnoliata*.
Ochreous-gray, with numerous, transverse, dark lines; median band narrow, pale, with a dark discal dot; hind wings whitish *G. amplata*.
Granite-gray, with a distinct median band, rows of dark points, and scattered yellow scales; hind wings gray, a little dusky on the margin *G. polata*.

B. ♂ antennae pectinated:

- Undersized. Uniform sable-brown; fore wings with a single, median, dusky band. Fringe sable-brown *G. Sabiniaria*.
Large size. Yellowish-gray, with broadly-pectinated antennae, median band, and submarginal, wavy, whitish line. Fringe yellowish, checkered with dark *G. phaeotaria*.

GLAUCOPTERYX CESIATA Hübner. Plate 8, fig. 16.

"*Geometra cesiata* Borkh., Ent. Schne., v. 354, 169, 1794."

"Den. et Schiff., 8, st. Verz. Schne., i, 118, 1775."

"Lang., Verz., 189, 1782."

"Hübner, Schne., Ent., 275, 1796."

Glaucopteryx cesiata Hübner, Verz., 332, 1818.

Larentia cesiata Frehrs., Schne., Ent., vi, part 2, 89, 1828.

Dup., Lep. France, viii, v, 598, pl. 199, fig. 2, 1830.

Guen., Phala., ii, 271, 1857.

Walker, List Lep. Br. Mus., xxiv, 1173, 1862.

40 ♂ and 40 ♀.—Body and wings dull smoky gray, with a decided olivaceous tinge, dusted with golden scales. Front whitish, with dusky scales; base of the antennae whitish, beyond minutely annulated with white; palpi

black-brown, much darker than usual. Fore wings broader than usual, with the costa a little more convex than usual, ashen, mottled thickly with dull, dark scales, which are arranged in three dark, dull, obscure, diffuse, broad bands, of which the outer two unite just below the median vein to form a broad patch. These lines are zigzag and scalloped on the outer edges, and margined with whitish points. A parallel row of irregular, golden scales, especially visible on the outer third of the wing, and also on the inner edge along its whole length. A scalloped, submarginal, white line. Edge of the wing dark; fringe uniformly dark. Hind wings with a distinct discal dot; clear in the middle, but, toward the outer edge, becoming mottled with dark, with a broad, zigzag, submarginal line. Abdomen dark, ringed with whitish. Beneath pale whitish cinereous; the lines obscurely repeated, especially marked on the costa, which is finely dusted with yellowish; abdomen paler beneath. Legs pale; fore legs dark, narrowly annulated with white. Discal dots faint on both wings.

Length of body, 0.52; of fore wing, 0.70; expanse of wings, 1.50 inches.

This is the largest native species of the genus, and differs in its short, dark palpi, triangular fore wings, which are olive-gray, dusted with bright golden scales on the outer third and on the inner margin, and very faintly on the outer edge of the secondaries.

It is an obscurely marked species, but the plan of the markings is much as in *G. polata*. The submarginal scalloped line is well marked, the scallops deep and rounded. The double-scalloped, light, extradiscal line is bent outward below the costa. There are dark and whitish specks and dots on the veins.

Okak, Northern Labrador, and Caribou Island, Southern Labrador (Packard). It also occurs not uncommonly at the White Mountains, where it was captured by Mr. C. A. Shurtleff, August 1-11, in Tuckerman's Ravine, specimens of which are in the collections of the Boston Society of Natural History. Mr. P. G. Sanborn has also obtained it from Mount Washington, New Hampshire. Massachusetts (Morrison). Georgetown and Turkey Creek station, Colorado (Mead).

Specimens taken by Mr. T. L. Mead in the vicinity of Georgetown, Colo., at an elevation of 8,000 or 9,000 feet, expand from 1.45 to 1.55 inches. The markings are just as in Labrador and White Mountains (New Hampshire) specimens, though with perhaps more golden scales. The Labrador speci-

mens are a little stunted, expanding from 1.10 to 1.15 inches. They agree with specimens from Iceland as to general appearance and size, but are not quite so dark, and have more golden-yellow specks. I have seen no specimens from this country or Labrador with such clear markings as in those received from the Austrian Alps, though the American specimens are rubbed. In size, the Colorado individuals resemble the European ones.

Larva.—The egg is laid on the slender stalks of the wort, whortleberry, or bilberry (*Vaccinium Vitis-Idææ*) in July and August, and the young caterpillar emerges in about twelve days, but soon hybernates on the surface of the earth, at the roots of the food-plant. It begins to feed again in April of the ensuing year, and is full-fed by the second week in May. It then rests on the stalk of its food-plant by day, generally with the head downward, and in a perfectly straight position. On the approach of evening, it turns round, re-ascends the stalk, and feeds on the leaves during the night. When full-grown, the head is prone, scarcely so wide as the second segment, and without any manifest notch on the crown. The body is of uniform substance throughout, and having a perceptible lateral skin-fold along the region of the spiracles: each segment has a few small warts, and each wart emits a short and feeble bristle. The color of the head is umber-brown, in some specimens inclining to red. The body is velvety red-brown or velvety olive-green. In both varieties, there is a series of medio-dorsal, V-shaped markings, of great beauty. These occur on the fifth, sixth, seventh, eighth, ninth, tenth, and eleventh segments. The apex of each mark points toward the head. The sides of these marks are not quite closed at this point, but allow the passage of a fawn-colored stripe, which expands immediately after entering the area enclosed by the V, and is again restricted to a mere line, where it approaches the boundary of the segment. The remainder of the area enclosed by the V is of a lovely rose-color. Each side of the V is bordered with rich brown. Anterior to each V—that is, adjoining the anterior margin of each segment—are four short, parallel lines, pale in the brown variety, perfectly white in the green one. The lateral skin-fold in both varieties is almost white, and thrown up in bold relief by contrast with the ground-color immediately adjoining it. The belly is of the prevalent ground-color. The legs are semi-transparent and pinkish; the claspers of the prevailing ground color. It spins a slight cocoon among the leaves of its food-plant, and changes to a chrysalis in May.”—*Newman's British Moths*, p. 110.

GLEATOPTERYX MAGNOLIATA Packard. Plate 8, fig. 17.

Sparganium magnoliata Guen., Phal., ii, 155, 1857.

Calappa cunctilis Grote and Rob., Annals. Lyceum Nat. Hist. N. Y., viii, 130, pl. 16, fig. 13, April, 1867.

Calappa 1-punctata Pack., Proc. Bost. Soc. N. H., xiii, 402, 1871.

Larentia cunctilis Pack., Proc. Bost. Soc. N. H., xvi, 20, pl. 1, fig. 8, 1874.

♂ and ♀.—Front gray, with a few yellow scales; orbits whitish; palpi tipped with whitish; four black dots on thorax, and one at the base of the patagia, which are tipped with black; a few golden-yellow hairs are scattered over the thorax; two rows of black dots along the abdomen; edges of the wings white. Legs black, ringed with white. Fore wings pale-gray, crossed by numerous wavy and zigzag white lines, originating from numerous black costal stripes; five whitish zigzag lines before the discal dot. These lines are edged with black, the basal one on the inside, the fourth on the outside. The discal dot is very distinct, and situated in a clear space, occupying the middle of the wing, with a costal band just over it. There are twelve of these short, costal, black bands connected with fainter lines crossing the wing. Beyond the discal dot is a double white line, with large scallops, terminating on the costa; a submarginal, more finely-scalloped, whitish line, parallel with the outer edge. Between these two lines, and about as far from the apex as the costa, are several black irregular dots, a part of them sometimes forming a short black line, bordering the extradiscal whitish line. All these lines are accompanied by scattered golden scales, but much less numerous than in *G. polata*. A row of black spots at the base of the fringe, composed of two twin subtriangular dots, opposite to which the pale-gray fringe is checkered with dusky. The discal dot is oval, black, and conspicuous. Hind wings whitish-smoky, tinged with flesh-color, entirely clear, with the fringe lined at the base, and otherwise as in the fore wings. The under side of the wings is tinged with salmon color, becoming deeper toward the apex of the fore wings; costa edged with black to just beyond the discal dot, which is large and prominent; a subapical, broad, subtriangular, black patch extends from the costa to the first median venule; a discal dot present on the hind wing; fringe more distinctly checkered with black than above, and with a heavier black line on the edge of the wing, interrupted by the venules.

Length of body, ♂ and ♀, 0.40; fore wing, ♂ and ♀, 0.55–0.60; expanse of wings, 1.20 inches.

London, Canada (Saunders); White Mountains, New Hampshire, August

13, and Treat's Island, Eastport, Me., July 16 (Shurtleff, Mus. B. S. N. II.); Mount Washington, New Hampshire, July (Morrison); Kenosha House, Colorado, June 30 (Mead); California (Edwards and Beltrami); "Canada" (Guenée).

This seems to be a more common species in California than in the Eastern States, though it is widely diffused over the colder portion and alpine regions of the country east of the Rocky Mountains. It is quite closely allied to *G. polata*, but differs in the fore wings being more obtuse at the apex, and the costa more convex. It may be recognized by the numerous, parallel, scalloped, blackish-gray lines; the large, distinct discal dot; the general steel-blue gray color of the wings; the very few yellowish scales; and by the entirely clear, pale, smoky, flesh-colored hind wings.

On examining M. Guenée's collection, I recognized it from memory as his *Spargania magnoliata*; and Mr. Morrison has since informed me that he identified it as such from M. Guenée's description, with which it agrees well.

I can find no differences between two specimens from the Atlantic States (one G. and R.'s type from Buffalo, and one from Maine, collected by myself), and twelve examples from California, collected by Mr. Edwards. It seems to be much more common in California than in the East. It is nearly related to *G. polata*.

The Colorado male (length of fore wing, 0.62 inch) is much larger than three females from New York and Northern New England; the length of the wing of the largest being 0.55 inch. The Californian specimens are also much larger (the fore wing of the largest female measuring 0.63 inch). Of nine Californian specimens, three are of the same size and the rest larger than eastern examples. There is, however, scarcely any difference in the shape of the wings, though the Californian specimens have on the whole very slightly more acute wings.

GLAUCOPTERYX IMPLICATA Packard. Plate 8, fig. 18.

Larentia implicata Guenée, Planch., 254, 1857.

Calaria multilincta Pack., Proc. Ent. S. N. II., xiii, 493, 1871.

2 ♂, 2 ♀.—This species is closely allied to *G. magnoliata* in the shape of the wings, but the costa is much straighter, and the apex more acute. Front gray, a chocolate-colored band between the antennae; a black spot on the front of the basal joint of the antennae; vertex behind the antennae whitish. Orbits and palpi reddish-brown, the latter white beneath at base. Prothorax

pale reddish-brown. Abdomen pale-gray, with a pair of diverging pale-brown spots on each abdominal ring. Fore wings with eleven costal dark marks, being the termination of as many lines crossing the wing with varying degrees of distinctness; two dark wavy lines near the base of the wing, the outer one bordered externally with white; then succeeds a pale-brownish band, with a few black dots, composing an obsolete line, but well marked on the costa; beyond, a row of white spots, beyond which is a broad ash band, like one just beyond the discal dot; the latter is distinct, oval, black, and situated in a band of clear gray, bordered with scalloped dark lines; beyond the extradiscal, broad, reddish-brown band is a row of white spots, succeeded by two rows of minute black dots on a clear ash ground; a submarginal, distinct, white, scalloped line, and a marginal, broken, black line, consisting of two intervenular black dots; the dots are externally edged with scattered groups of reddish scales. The fringe is white, checkered with dusky. Hind wings pale-ash; outer edge dusky, with a submarginal pale line; edge of the wing and fringe as in fore wings; a minute, linear, discal dot. Beneath, four discal dots of equal size and very distinct; both wings pale whitish-gray, with two obscure extradiscal lines, and a submarginal, diffuse, half-effaced, dusky line on both wings.

Length of body, ♂, 0.40, ♀, 0.55; fore wing, ♂, 0.55, ♀, 0.64; expanse of wings, 1.20–1.25 inches.

California (Edwards); Sierra Nevada, Cal. (Crotch, M. C. Z.).

This species differs very decidedly from any of the others in the rather narrow, whitish, or ochreous-whitish, median line enclosing the discal dot. This band is bordered on each side by a little darker band of equal width to the median, all the bands being scalloped. The general hue of the fore wings is pale ochreous grayish-brown, with many black and white dots and streaks. In one female, the median line is almost pure white, with fine gray scales, and the bands on each side are obsolete; the scallops represented by black marks on the veins. Half-way between this and the submarginal white line is a row of black dots. In another female, the fore wings are decidedly ochreous-brown, with the median band much paler, and broken up into separate round spots.

GLAUCOPTERYX POLATA Packard. Plate 8, fig. 19.

Larentia polata Dup., VII (v. 6), 1842, pl. 13-9, fig. 4, 1-50.*Larentia Poullet* LeGeyre, Ann. Soc. Ent. France, 339, pl. 8, figs. 8, 18-36.*Mabouthis polata* Cresson in Hübner, Zett., v, 6, figs. 105, 106, 1-1837.*Larentia Brathata* Dup., Suppl., iv, 1842, pl. 52, figs. 1, 18-42.*Larentia polata* Guen., Chalc., ii, 271, 1-77.*"Phospha polata* (Beard?), Christoph. Wien. Monatschr., 313, 1858.*Larentia polata* Walker, List Lep. Br. Mus., xxiv, 1173, xxvi, 1697, 1862.

80. ♂ and ♀.—Wings rather narrow, with the apex more acute and the costa straighter than usual, much more so than in *G. magnoliana*, its nearest ally in the United States. Male antennae simple, finely ciliated beneath; palpi large, broad, bushy beneath. Body and wings granite-gray, the ground color whitish-ash. Head and thorax with dark and light long scales, unusually bushy; a black spot between the antennae. Fore wings crossed by eight more or less distinct dark lines; a blackish, thick, basal line, divided into four scallops; beyond, a broken, more diffuse line, succeeded by a linear, broken line. Then comes the median, broad, dark band, paler in the middle, with golden scales enclosing the distinct, black, discal dot. This discal area varies much in extent; the band being either forked on the costa, where the discal dot is very distinct, or dark, and closing over the discal area. Each side of the band is irregularly scalloped; beyond is a broad whitish band, with scattered golden scales, as in the white spaces between the lines within and in the median band. In the middle of the space is a row of black dots; beyond is a dark, broad, submarginal band, sending points inward along the veins; sometimes the band is double. It is edged externally by an indistinct, zigzag, white line. The edge of the wing is clear grayish-white, with a series of black marks on the ends of the veins. Fringe on both wings white, checkered with dark. Hind wings smoky-white, with a broad paler band just beyond the middle, succeeded by a narrow dark band, or this band is continuous with the dark edge of the wing, and contains an obscure, whitish, zigzag line. Sometimes the whole wing is dusky, and the lighter bands and lines are effaced. Beneath, uniformly stone-gray, but with a faint ochreous tinge; the discal dots large and distinct on both wings; a costal dark spot beyond the discal dot; a submarginal, diffuse, dusky band on each wing. Legs dark-gray, ringed with white. Abdomen with two rows of diffuse dark spots.

Length of body, ♂, 0.15, ♀, 0.12; of fore wing, ♂, 0.57, ♀, 0.55, expanse of wings, 1.20 inches.

Hopedale, Indian Harbor, Henley Harbor, and Caribou Island, Straits of Belle Isle, August (Packard).

This is a truly arctic species, being found in Greenland and Lapland, and the colder, exposed, treeless portions of the Labrador coast. It has not yet been detected on the alpine summits of New England or the Rocky Mountains, or in the European Alps.

This arctic species differs from any other in the grayish-white wings, peppered with dark scales, with a distinct, median, dark band, paler in the middle, and usually forked on the costa.

Seventy-five specimens were captured by me in a single day (August 22), on a naked, almost bare rock, at Table Island, in Henley Harbor, which is much exposed to the open sea. They were in great abundance, settling down with their peculiar vacillating flight, like feathers, on the ground. There was considerable variation among them. Some were more dusky than others, with a greater profusion of golden scales. In others, the central dark band of ringlets became reduced to mere points on the inner edge, with the region on each side very pale and almost entirely free from yellow scales, or the entire line may consist of points alone, accompanied by a broad, dusky, submarginal band. Others have no yellow scales at all, and the mesial band is diaphanous, leaving the discal dot very distinct, while all the characteristic bands and rows of dots are brought out in very clear relief, as in Lefebvre's var. *Brullei*. The size of the dusky spots on the fringe varies greatly.

The most aberrant example has whitish-gray wings, with fewer dark lines than usual. The base of the fore wings is black; beyond is a broad dark line, while the median dark band is narrow, almost obsolete, consisting of isolated square spots, with a large, discal, double patch, and a broad pale space on the costa in front of the discal spot. Near the outer edge of the wing is a broad dark band.

In its colors, it affords a good instance of protective mimicry; its tints closely resembling the lichen-covered, peculiar, gray gneiss-rocks on the coast of Labrador. In this respect, it resembles the *Anarta*, which have the same colors, and can scarcely be distinguished from the lichen-covered rocks or which they settle down after taking flight.

GLAUCOPTERYX SABINIARIA Packard. Plate 8, fig. 29.

Psychophora Sabini Curtis, Appendix, Ross's 2d Voyage, 76, pl. A, fig. 7, 76, 1-55.

7 ♂ and 1 ♀. While this species belongs to a subgenus of *Glaucopteryx*, differing in the venation, in the pectinated antennae, and hairy, stouter, shorter abdomen, in the general shape of the wings it closely approaches *G. polata*, but still differs in the straighter costae of the fore wings, which are also a little narrower than in *polata*, and the head is a little fuller in front. Antennae with short, slender pectinations, as long as the antennae are thick, also thickly ciliated beneath. Body and wings of a peculiar sick sable-brown; fore wings sable-brown, frosted over with gray scales, darker at base; the dark portion (basal line) bent outward on the subcostal vein; a broad, median, darker band, no wider on the costa than inner edge of the wing, with a large projection outward opposite the discal dot, and below scalloped quite regularly; a scallop in each interspace. Discal dot linear, dark, obscure. No other lines or markings on the wing. Hind wings (in my eight specimens) immaculate, concolorous with the fore wings, being sable-brown, without any gray scales, and with no lines. (In Curtis's figure, two curved lines beyond the discal dot are represented.) Fringe uniformly sable-brown, concolorous with the wings. Legs and under side of the body darker than above. Abdomen very stout; the tip broad and very hairy.

Length of body, ♂ 0.40, ♀, 0.31; of fore wing, ♂, 0.52, ♀, 0.46; expanse of wings, 0.95-1.10 inches.

Polaris Bay, North Greenland, latitude 81° 38' N. (Dr. E. Bessels, scientist to the United States Polaris Expedition to the North Pole).

This is an exceedingly interesting form, as it differs so remarkably, both structurally and in coloration, from the other species. The uniform sable-brown color, with the slightly darker median band on the fore wings, and the pectinated and ciliated antennae, and very stout, broad, hairy, tipped abdomen, separates it from the other species found on this continent.

None of the specimens collected by Dr. Bessels in Polaris Bay had the two dark lines or discal dot on the hind wings, figured by Curtis in the Appendix to Ross's Voyage. Five of my specimens are immaculate, sable-brown, with no dusky band on the fore wings, and the fore wings are of a pure sable color, with a rich silken gloss; no gray scales frosting them over, as in the more typical examples. My specimens differ so much from two

G. frigidaria (Guenée's sp.), received from Lapland, through Dr. Staudinger, both in size and markings, that I am at present (notwithstanding the great amount of variation in the species of this genus) inclined to keep the two species separate until new material decides the question.

My two *G. frigidaria* are larger than *sabiniaria*, the fore wings expanding 1.06 inch, while my single female *sabiniaria* expands only 0.95 inch. Guenée's male expanded 0.32 inch more, or 1.28 inches. In *frigidaria*, the band is much wider on the costa than in *sabiniaria*, more finely scalloped, and there is a discal dot on the hind wings and two outer curved lines. The fringe is whitish, checkered with dark; while in *sabiniaria* it is uniformly sable, and not checkered with darker scales. It should be remarked, however, that Curtis's figure represents a dot and two outer curved dusky lines on the hind wings, thus in part connecting the two species, and it is possible that they will prove identical.

Larva.—In a bottle marked by Dr. E. Bessels with the same number (6) as the pinned moths, and labeled "Polaris Bay, August 2, 1871," is a larva which seems to be of this species. The body is moderately thick, of uniform size from the head to the tail. The head is smooth, rounded, not so wide as the body. The supra-anal plate is rounded posteriorly. The body is blackish, with scattered, rather stout hairs; the tubercles from which they arise being pale. There is a dorsal row of peculiar conspicuous square spots, one on each ring, and a lateral row of irregular, concolorous, pale dots. Length, 0.55 inch.

GLAUCOPTERYX PHOCATARIA Packard. Plate 8, fig. 21.

Cidaria phocata Möschler, Wien. Ent. Monatschr., vi, 9, taf. 1, fig. 8, 1892.

Vorderflügel gelbgrau, im Mittel- und Saumfeld mit vorherrschendem Grau, drei dunkle, dicht angelegte Querstreifen, lichte Wellenlinie und dunkler Mittelpunkt. Hinterflügel grau mit dunklem Mittelpunkt.

Flügelspannung 27–33 Millim. Vorderflügelbreite 7–8 Millim.

Steht der *Cidaria frigidaria* Guen. am nächsten, unterscheidet sich jedoch so wesentlich von ihr, dass an keine Vereinigung gedacht werden kann.

Die Fühler des Mannes sind gekämmt, ihre Kämmezähne stehen wie bei *frigidaria* ziemlich entfernt von einander, sind ebenfalls behaart, aber

nicht wie bei jener Art keulenförmig. Die Anhangzelle ist bei meinen Exemplaren ungetheilt. Die Palpen sind dicht behaart und fast länger als bei *frigida*. Sie, sowie Kopf, Thorax, und Hinterleib, sind gelbgrau behaart.

Die Grundfarbe der Vorderflügel ist ein trübes Orangeb, welches bis zum Mittelfelde in mehr grauen oder mehr gelben Linien abwechselt. Das Mittelfeld färbt sich dunkler grau, nur gegen den Vorderrand zeigen sich gelbliche Bestäubung; der Mittelpunkt ist schwarz; eingefasst wird es von dunkleren, auf ihren entgegengesetzten Seiten weissgrau angelegten, stark gezackten Streifen. Hinter ihm ist eine durch eine graue Linie getheilte gelbliche Binde, welche an das graue Saumfeld grenzt. Letzteres wird von der weissgrauen, stark gezackten Wellenlinie durchschnitten. Saumlinie fein dunkel, Fransen gelblich, mit lichter Wurzelhälfte, auf den Rippen schwach dunkel gescheckt. Hinterflügel grau, mit dunklem Mittelpunkt; Fransen denen der Vorderflügel gleich. Unten alle Flügel grau, auf den vorderen vor der Mitte erscheint das lichte Feld und die Wellenlinie als helle Binde; die Hinterflügel sind heller grau, der Saum und zwei Querstreifen dunkler. Alle Flügel mit dunklem Mittelpunkte.

Ich erhielt drei gute Exemplare (1 ♂, 2 ♀) dieser Art von Labrador.

My figure and description is copied from Möschler's. The artist has not made the antennae broadly enough pectinated. This moth is evidently a *Glaucopteryx*.

PLEMYRIA Hübner. Plate 1, fig. 3.

Plemyria Hübn., Verz., 331, 1818.

Aedalia Tröts., (in part), Schum. Eur., vi, 5, 1828.

Camplogramma Steph., Hbt., Haust., iii, 263, 1831.

Larentia Dup., (in part), Lep. France, Noct., iv, 389; v, 358, 1830.

Boisd., (in part), Gen. Ind., 201, 1830.

H. Sch., (in part), Schum. Eur., iii, 144, 1847.

Plemyria and *Camplogramma* Steph., List. Lep. Br. Mus., 208, 209, 1850.

Calaria Led., (in part), Verh. B. Z. Ges. Wien, 253, 1853.

Camplogramma Guen., Phal., iii, 122, 1857.

Walk., Lep. Het. Br. Mus., xxv, 1323, 1852.

Head not so full and broad in front as in *Glaucopteryx*, with a well-marked interpalpal tuft. Male antennae heavily ciliated; the cilia arising from conical projections. Palpi long and slender, projecting in front by a distance equal to the width between the eyes; third joint slender, acute. Fore wings with the costa straight, sometimes full and sinuous; apex subacute, not much produced; outer edge not very oblique. Hind wings with the outer edge somewhat sinuous, the middle being full, and forming a slight, rounded pro-

jection. Venation: much as in *Glaucopteryx*; but the discal venules are situated within the middle of the wing, while in *Glaucopteryx* they are without, and, consequently, the median venules are longer than in that genus; two subcostal cells; posterior discal veins regularly curved; the first median venule arises nearer the second than in *Glaucopteryx*. Hind legs with the tarsi shorter than the tibiae. Abdomen moderately long, with a short, square anal tuft. Coloration: entirely different from *Glaucopteryx*, the species being reddish in the female, with numerous fine, distinct, wavy lines, and sometimes a conspicuous white discal ringlet. The sexes differ much in color.

The species of this genus differ from *Glaucopteryx* in their color and smaller size, the long, slender palpi, and narrow front of the head.

Hübner mentions only *P. gemmata* and *P. flaviata* under this genus. It should clearly have the priority over *Camplogramma*.

Larva.—"Of medium length, not attenuated, flattened above, laterally carinated, with distinct lines, with piliferous warts arranged in trapezoids, and a rounded anal flap; head small and subglobular; living on low plants. Pupa subterranean."—Gueneé.

Synopsis of the species.

A large white ring around the discal dot; ten lines. *P. flaviata*.
About fifteen light lines, alternating with reddish-brown bands. *P. multifurcata*.

PLEMYRIA FLAVIATA Hübner. Plate 8, fig. 23, 24.

* *Geometra flaviata* Hüb., Schm. Eur., tab. 54, 2-9, 2-1; *gemma*, 2-3, 1793.**

Plemyria flaviata and *gemma* Hüb., Verz., 331, 1813.

Aedulia flaviata and *gemma* Tröts., Schm. Eur., vi, 55; Suppl., 297, 1828.

Larentia gemmata Dup., Suppl., iv, 3-9, pl. 21, fig. 6, 1842.

Larentia gemmaria and *flaviaria* Boisd., Gen. Ind., 395, 1849.

Larentia flaviaria and *gemmaria* H.-Sch., Schm. Eur., iii, 175, 1847.

Plemyria gemmata Steph., List Lep. Br. Mus., 203, 1859.

Calaria flaviata Led., B. Z. Ges. Wien, 265, 1853.

Camplogramma flaviata and *gemma* Guen., Phal., ii, 429, 439, 1857.

Walk., Lep. Het. Br. Mus., xxv, 1325, 1862.

24 ♂, 23 ♀.—Body and wings dull clay-yellowish; head darker. Fore wings dull clay-yellowish, the ground-color lighter than the body and hind wings; three basal, wavy, white lines, edged irregularly with black. A median blackish band, widest in the discal space; both edges irregularly sinuous; the outer edge with a prominent tooth below the costa, and another on the base of

* When I have been unable to consult the works cited, or verify the synonymy, I have put the reference in quotation-marks.

the first median venule. This band incloses a prominent, large, roundish, black discal dot, with a faint whitish circle around it, but not nearly so distinct as in the female. A white line, mixed with dark, angular, wavy, and parallel with the outer edge of the median band, and situated half way between the band and the outer edge of the wing. A fine, wavy, white, submarginal line; a prominent, long, dark, oblique, apical streak, edged above with white. Fringe on both wings with a prominent white line at base. Hind wings dusky within the middle, inclosing the small discal dot; beyond are four or five wavy lines like those on the front wing, with a more prominent one half-way between the dark inner portion and the edge of the wing; beneath, the lines are distinctly reproduced, but not the median band; the costa is checkered with light and dark spots, and there is a small, black, discal dot.

Female of the same form and size as the male, but the ground-color is a uniform, bright, clear red. The dark mesial band is consequently indistinct; but the large, conspicuous, broad, white, discal ringlet will easily distinguish this species from any other Larentian moth. The outer line is white, wavy, and irregular, and much more distinct than in the male. The markings on the under side of the wings are much as in the male; but the outer line, common to both wings, is much darker and more distinct than in the male.

Length of body, ♂, 0.30, ♀, 0.35; of fore wings, ♂, 0.42, ♀, 0.45; expanse of wings, 0.90 inch.

London, Canada (Saunders); Mount Washington, N. H., July (Morrison); Brunswick, Me. (Packard); Salem, Mass., at light, May 27, July 18 (Cassino); Nahant, Mass. (Moering); Massachusetts (Harris Coll., Sanborn); West Farms, N. Y. (Angus); Albany, N. Y., September 27 (Lintner); New Jersey (Sachs); Philadelphia, Pa. (Amer. Ent. Soc.); Easton, Pa. (Snultz); Pilatka, Fla., February (Burgess); Saint Louis, Mo., February 6 (Riley); Detroit, Mich. (Swartz, M. C. Z.); Dallas, Tex., August, not rare (Boll); Waco, Tex., March 23, July 12 (Bellinger); Lawrence, Kans., May 1 (Snow); California (Behrens and Edwards). It is evidently double-brooded.

The Californian examples are a little larger (length of wing, ♀, 0.48 inch) than eastern ones.

Staudinger gives as the range of this species, Central and Northern Europe, England, Bithinia, Syria, and Amur.

Larva.—That *P. glauca* is the male of *gemmata* was proved by a writer

in the "Entomologist's Intelligencer" for 1858. The following remarks are taken from Newman's British Moths, 1869:

"I have found the caterpillar of this geometer on the leaves of the common persicaria (*Polygonum persicaria*): but I have not described it from nature, as a very accurate description, which I have quoted below, was previously published in the 'Entomologist's Intelligencer' for 1858: 'A lovely female of this species laid me some eggs on the 24th of July. They were oblong, flattish, and yellow, but changed to a dusky-brown color on the 1st of August. The following day, the caterpillars hatched. At first, they were very dingy, but on the 8th of August became dusky sap-green, and on the 16th assumed their characteristic markings. There were evidently two distinct varieties, one of which had the ground-color of a greenish gray, tinged with red between the segments; the spiracular line blackish, and irregularly interrupted; the back (except the last two segments) dusky, having on the intermediate segments a row of five elongated diamonds of the ground-color, with a dusky dot in each; on the front segments, these markings ran into three parallel dusky lines, while, on the end segments, there were four slender, dusky lines arranged in a diamond pattern; the claspers had a dusky stripe running down them. The other variety had the ground-color of a light yellowish green, quite yellow between the segments; the spiracular line and pattern on the back faintly indicated by dusky-black lines and dots. These caterpillars fed readily on groundsel (*Senecio vulgaris*), at last eating through stems bigger than themselves; but, as their frass seemed very watery, I doubt whether this is their proper food. They were quiet in their habits, resting on the under side of the leaves, hiding themselves skillfully, and could not be easily dislodged. When disturbed, they curled up the front segments, but not into such a twisted knot as I have sometimes seen in more slender geometers. From the 21st to the 23d of August, the caterpillars, being full-fed, spun up in moss. After having been in chrysalis about a fortnight, the perfect insects emerged. There went down two of the green and four of the darker caterpillars. These have come up again, one *C. fluviala* (male), and five *C. gemmaria* (female), such a narrow risk did I run of missing the solution of this problem. Solved, however, it is; and *C. fluviala* and *C. gemmaria* are hereby declared to be man and wife. I expected to find the difference of color in the caterpillar would turn out to be a sexual one; this, however, has been contradicted by the result. The chrysalis is brown, smooth, spiked at the

tail, and inclosed in a thin silken cocoon in moss. I have now seen, in all, about fifteen specimens of *C. fluriata* and six of *C. gemmaria*, and find that the absence in each of what were considered the distinctive markings of the other is not constant. The subapical blotch of *C. fluriata* may be traced more or less distinctly (sometimes quite distinctly) in *C. gemmaria*, while some specimens of *C. fluriata* have the central spot placed in the light ring; only the dark ground of *C. gemmaria* makes this ring shine forth much more brightly, just as a negro's sable skin enhances the whiteness of his eyes. One of my bred specimens, having given me the slip over the edge of the table, was detected in a dark corner of the room by the white spots on the fore wings. As to the other markings, they are, line for line, precisely similar; so that the ground-color alone remains to make the sexes look unlike, and perhaps further breeding may sometimes upset this."

PLEMYRIA MULTIFERATA Packard. Plate 8, fig. 22.

Camptogramma multifirata Walk., List Lep. Het. Br. Mus., xxvi, 1715, 1-62.

5 ♂.—Body and wings reddish-brown, with a slight purplish tinge. Fore wings with the costa fuller, more sinuate than in *P. fluriata*, crossed by about fifteen parallel lines at a regular distance apart; the lines are firm, not very sinuate, with reddish-brown bands between them. A band just beyond the middle of the wing is somewhat irregular, broken transversely into two or three pieces, and is wider on the costa than elsewhere. A submarginal white band is much more sinuate than the others, making a large, rather deep, subapical flexure. This line is double. Another whitish line, between it and the edge of the wing, ends firmly on the apex, and posteriorly ends just before the inner angle of the wing. On the hind wings, which are rather paler than the anterior pair, and are a little less sinuate on the outer edge than in *P. fluriata*, there are about five dark lines, the inner three of which fade out before reaching the middle of the wing. A small discal dot, situated far within the middle of the wing, as in *P. fluriata*. Beneath reddish-brown, with whitish blotches and lines, effaced behind the costal region and toward the base of the wing. Costal region checkered and marked with reddish-brown and white. A regularly and deeply scalloped submarginal line; a distinct, oblique, apical, white line. Hind wings colored much as above.

Length of body, ♂, 0.40; of fore wings, ♂, 0.50-0.54; expanse of wings, 0.95-1.10 inches.

H. P. N.

Quebec, Canada (F. X. Bélanger); Brunswick, Me. (Packard); Cambridge, Mass. (Harris Coll.); Brewsters, N. Y. (Grote); Ithaca, N. Y. (H. H. Smith, Corn. Univ.); Oneida, N. Y. (R. V. Hawley); Brooklyn, N. Y. (Graef); Phil. Pa. (Amer. Ent. Soc.); Missouri, May (Riley); Lawrence, Kans., April 30 (Snow); Victoria, Vancouver Island, July (Crotch); Nova Scotia.

This remarkable species need not be confounded with any other Geometrid moth, the markings are so peculiar; as many as fifteen light lines alternating with reddish-brown bands.

Desideratum.

Coromia abruptata Walk., List. Lep. Br. Mus., xxvi, 1713, 1862. This is a *Plemyria*.

EPIRRITA Hübner. Plate 1, fig. 4.

Epirrita Hübn., Tentamen, 1810 (or before).

Oporinia Hübn. (in part), Verz., 321, 1818.

Acidalia Treits. (in part), Schm. Eur., vi, 5, 1828.

Larentia Dup. (in part), Lep. France, Noet., viii (v), 358, 1830.

Oporabia Steph. Iltr. Haust., 273, 1831.

Fenusia Curt., Br. Ins., 759, 1839.

Eubolia Boisd. (in part), Gen. Ind., 201, 1840.

Larentia Boisd. (in part), Gen. Ind., 204, 1840.

Hydrelia H.-Sch. (in part), Schm. Eur., iii, 110, 1847.

Larentia H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Oporabia Steph., List. Lep. Br. Mus., 198, 1850.

Calaria Led. (in part), Verh. B. Z. Ges. Wien, 253, 1853.

Fenusia Guen., Phal., i, 440, 1857.

Oporabia Guen., Phal., ii, 261, 1857.

Fenusia Walk., Lep. Het. Br. Mus., xxii, 678, 1861.

Oporabia Walk., Lep. Het. Br. Mus., xxiv, 1167, 1862.

Head large, with the front very full, bulging out much more than usual. Palpi small and slender, not reaching to the front. Antennæ either pectinated, the branches fine, slender; or short and stout, ciliated, or simply ciliated. Fore wings short and broad, triangular, the costa being much arched toward the apex, which is much rounded, especially in the male; outer edge as long as the inner in the male, shorter in the female. Hind wings large, long, and rounded, extending far beyond the end of the abdomen. Venation much as in *Glaucopteryx*, but the venules, especially the second and third subcostal, are much shorter; the posterior discal venule very oblique, and not bent, while there is but one subcostal cell. Hind tarsus a little shorter than the tibia. Abdomen long and slender, with a very slight anal tuft. The coloration is peculiar, but very uniform in the different species. They are whitish-gray, with about a dozen wavy, darker lines, somewhat broken between the veins. The origin of the first and second median venule is black.

This genus is easily distinguished by the antennae being sometimes pectinated (*E. cambricaria* and *E. 12-lineata*); by the bulging front, darker than the rest of the head; by the feeble, slender palpi not reaching the front; as well as by the broad, short, triangular wings. In all these characters, except the antennae, which are sometimes pectinated in *Glaucopteryx*, it differs from the latter genus, though closely like it in venation.

Larva.—"Rather short, a little flattened, velvety green, with the ventral region white or glaucous; head small and globular; living exposed on trees. Pupa subterranean."—Gueneé. *E. cambricaria* appears by Newman's statement to remain in leaves in the pupa state.

It is singular how constantly *E. cambricaria* has been separated generically from *E. dilutata*; though, according to Lederer, it was regarded by Standfuss as a variety of *E. dilutata*. Why Curtis separated it from "*Oporabia*" does not seem plain, as he remarks that "it is doubtful whether it may not be necessary to remove *Oporabia* to the genus before us." He then compares *E.* (his *Venusia*) *cambrica* with *E. dilutata* and *E. multistrigaria*. *E. cambricaria* is so close to *E. dilutata* that I had regarded it as a variety of that species, and referred to it under that name in Hayden's Report for 1874.

There seems no good reason why Hübner's name *Epirrita* should not be restored, though he ignored it in his Verzeichniss and used *Oporinia* instead.

Synopsis of the Species.

Very small, with broad, diffuse lines, or, when a little rubbed, about twelve lines on the fore wings; four lines on under side of hind wings *E. perlineata*.
Like *E. perlineata*, with twelve fine lines on the fore wings *E. 12-lineata*.
Nearly twice as large as the preceding, with a well-marked, black V on the origin of the first and second median venules; antennae pectinated. *E. cambricaria*.
Larger than *E. cambricaria*, with similar markings; antennae simple. *E. dilutata*.

EPIRRITA PERLINEATA Packard. Plate 8, fig. 25, 68.

Larentia perlineata Pack., Proc. Bost. S. N. H., xvi, B, 1874.

5 ♂, 5 ♀.—Closely resembling, in size, shape, and markings of wings, *E. 12-lineata*. The head is whitish-gray above, in front dark-brown; the palpi brown at tips above. Antennae simple. The fore wings are white, crossed by numerous wavy, fine lines, about twelve in number. It differs chiefly from *E. 12-lineata*, however, in the median line being much broader and more distinct, and with a broad ochreous shade between it and the line beyond. The hind wings are white, with the scalloped lines on the

outer half of the wing very distinct, being continuous and a little diffuse. Beneath much as in *E. 12-lineataria*, with four well-marked lines on the hind wings, the innermost quite near the base of the wing. Abdomen whitish-gray, unspotted. Legs: two anterior pair dusky above; hinder pair white.

Length of body, ♂, 0.32, ♀, 0.30; fore wing, ♂, 0.45, ♀, 0.42; expanse of wings, 0.84 inch.

Mount Washington, N. H., July, common (Morrison); Albany, N. Y., May 4 (Lintner); Brooklyn, N. Y. (Graef); West Virginia, April (Mead).

This small species is half the size of *E. cambicaria*, and differs in having about twelve fine lines on the fore wings and four or five unbroken lines on the hind wings. The median line on the fore wings is very distinct, and with a brownish and ochreous shade beyond.

EPIRRITA 12-LINEATA Packard. Plate 8, fig. 26.

Laurentia 12-lineata Pack., Proc. Bost. S. N. H., xvi, 19, pl. 1, fig. 1 *bis*, 1874.

3 ♂, 5 ♀.—An unusually small species, half the size of *E. dilutata*, and about as large as *E. albulata* of Europe. Male antennæ well ciliated. Head above whitish-gray, in front dark-brown; palpi brown at tip, paler below. Body and wings white, with a slight grayish tinge on costa of fore wings and on the thorax. Wings of the same form as in *E. dilutata*, except that the apex of the fore wings is rather more pointed. Fore wings white, crossed by about twelve black, thread-like lines, waved or scalloped, the outer ones mostly represented by venular black dots. The inner lines are usually scalloped. All the lines are more distinct and broader on the costa, and angulated outward more or less acutely just below the costa. Across the middle of the wings run three parallel lines, finer and nearer together than the others. The marginal row of intervenular black spots distinct on both wings. Hind wings white, with four or five dark, slightly-marked lines, of which the two inner are scalloped, while the three outer are represented by venular dark points. Beneath a little more dusky than above, with the lines on the inner half of fore wings wanting; a median, double, dusky line, ending in a dark, clear spot on the costa and inner edge. The lines beyond faint. The marginal black line distinct on both wings. Hind wings marked like the fore wings. Discal dots indistinct on both pairs of wings. Abdomen dull-whitish, unspotted. Fore legs brown, banded with narrow white rings; hind legs whitish.

Length of body, ♂, 0.33, ♀, 0.50; fore wing ♂, 0.15, ♀, 0.10; expanse of wings, 0.85–0.90 inch.

This diminutive species seems to occur commonly in California, where it has been collected by Mr. Edwards. It also occurs at San Mateo, Cal.; specimens having been collected by Mr. Alex. Agassiz (Mus. Comp. Zoölogy). It has been taken by Mr. Behrens at Sanzálito, February 4–26, March 22, April 23, May 2. It may be recognized by its small size and white, many-lineated wings. From Guenée's *L. implicata* it differs in the wings being entirely white, and also in the markings, as well as the smaller size. It may be found to intergrade with *E. perlineata* of the Eastern States. It is a little larger, and with more acute fore wings, than that species or variety (?).

EPIRRITA CAMBRICARIA Packard. Plate 8, fig. 27

Feansia cambrica Curt., Br. Ent., pl. 759, 1839.

Hydrula crutaria Dup., Suppl., iv., pl. 54, fig. 4, 1842.

Eubolia crutaria Bours., Gen. Ind., 203, 1840.

“*Cidaria nebulosaria* Freyer, Eur. Schm., tab. 528” (date ?).

Hydrula crutaria H. Sch., Schm. Eur., iii., 111, figs. 258, 259, 1847.

Cidaria cambrica Led., Verh. B. Z. Ges. Wien, 265, 1853.

Feansia cambrica Steph., List Lep. Br. Mus., 186, 1859.

Feansia cambricaria Guen., Phal., i., 449, 1857.

Walk., Lep. Het. Br. Mus., xxii., 678, 1861.

6 ♂, 2 ♀.—Considerably smaller than *Epirrita dilutata*, with distinctly-pectinated antennae and more triangular fore wings. Palpi small and slender, short, black beyond the middle. Head brown in front; antennae dark-brown above, with ciliated, slender pectinations, about twice as long as the antennae are thick. Body and wings light whitish-gray. Fore wings with seven well-marked lines, the three inner and extradiscal lines black, and the most distinct. The basal line very near the insertion of the wing bent outward acutely on the subcostal and less so again on the median vein. The second line is brown rather than black below the costa, and situated nearer the third than the basal; it is sharply angulated outward in the costal space, and slightly curved below, but not wavy. The fourth line black, forming below the costa a hair-line, and accompanied within by a brown shade. Both lines disappear between the median and internal vein. A small black discal dot, nearly touching a brown, wavy hair-line. The extradiscal line black and heavy in front of the median vein; not bent on the costa as in *E. dilutata*, but straight, and only curved inward just below the median vein, below which it is wavy. It is

accompanied externally by a diffuse, wavy, brown shade. From the dark shade, two diverging, conspicuous, black streaks follow the base of the median veins, forming a rude \succ . Two similar, but parallel, black streaks follow the origin of the two lower subcostal veins; beyond are two scalloped submarginal lines; a marginal row of black triangular spots. Fringe whitish. Hind wings whitish, with four wavy lines, the two submarginal ones acutely zigzag. A slight discal dot. Beneath, the fore wings are somewhat dusky; the hind wings pale-whitish, with a faint ochreous tinge. The discal dots are more distinct than above on both wings, with a common, sinuous, extradiscal line, and a submarginal, fainter, double line, most distinct on the costa. Legs whitish; fore legs dark in front. Abdomen whitish gray, with paler narrow rings.

Length of body, ♂, 0.43, ♀, 0.41; of fore wings, ♂, 0.45, ♀, 0.46; expanse of wings, 1.12 inches.

Quebec, Canada (Bélanger); London, Canada (Saunders); Mount Washington, N. H., July 7 (Morrison and Sanborn); Catskill, N. Y. (Mus. Comp. Zool.).

Larva—"The eggs are laid about the 17th of July, and the young caterpillars emerge about the 27th. They feed on mountain-ash or rowan-tree (*Pyrus aucuparia*), and, when full-fed, spin together a division of the leaf of the food-plant, and change to a chrysalis."—Newman's British Moths, 76.

This seems to be a truly mountain-species, not yet having occurred in the lowlands. It is closely allied to *E. dilutata*, but is considerably smaller, with more distinctly triangular wings and well-pectinated antennæ; those of the latter species being simple. The markings, which in their general arrangement are closely similar to those of *E. dilutata*, differ in the extradiscal line being straight on the costa, while there are more lines on the hind wings.

The present species differs from *E. perlineata* and *12-lineata* in its much larger size, the strongly-pectinated antennæ, the straight extradiscal line, and in the distinct V, &c., on the middle of the wing, though this is indicated in both of the diminutive species. From *E. dilutata* it differs in its smaller size and pectinated male antennæ.

There is not much variation among my specimens, which are all well preserved. In one specimen, collected by Mr. Morrison, the row of black, short streaks, half-way between the extradiscal line and the edge of the wing,

is more regular and distinct than usual, owing to the obsolescence of the usual scalloped shades or lines on each side.

Compared with two European alpine examples received from Dr. Staudinger and Professor Zeller, there are no apparent differences either in size or markings.

EPIRRITA DILUTATA Hübner. Plate 10, last fig.

"*Geometra dilutata* Bockh., Eur. Schm., v, 290, 1791."

"Hübner, Schm. Eur., tab. 36, fig. 188, 1796."

Epirrrita dilutata Hübner, Tent., 1806, 16.

Oporinia dilutata Hübner, Verz., 322, 1818.

Adelalia dilutata Treitsch., Schm. Eur., vi (ii), 26, 1828.

Oporabia dilutata Steph., Ill., iii, 273, 1831.

Larentia dilutaria Boisd., Gen. Ind., 207, 1840.

Larentia dilutata Hübner, Schm. Eur., 160, fig. 188, 1847.

Oporabia dilutata Steph., Cat. Br. Lep., 198, 1850.

Guen., Phal., ii, 262, 1857.

Cidaria dilutata Staud., Cat., 80, 1861.

Oporabia dilutata Walk., List Lep. Hel. Br. Mus., xxiv, 1168, 1862.

10 ♂.—This is a much larger species than *E. cambricaria*, but with very similar markings. It may always be distinguished by the simple male antennae. Body and wings pale ash-gray. Fore wings with eight well-defined sinuous or scalloped blackish lines, most distinct on the costa and veins; the basal line is heavy, and bent rectangularly between the subcostal and median veins; the next line, rather remote from the basal, curves inward on the subcostal vein, and outward on the median space; the two lines beyond are approximate, but less sinuous; the fourth line from the base of the wing is broad, diffuse, twice as broad on the costa as the three others; beyond this line is a clear median space, in the middle of which is the distinct discal dot; beyond are four more or less distinct lines, of which the outer (or submarginal) is most distinct and regularly scalloped; a marginal row of twin black dots; fringe whitish. Hind wings with traces of four scalloped lines, the marginal one the heaviest; marginal spots and fringe as in the fore wings; beneath, the lines on the hind wings are much as above; but those on the fore wings are obsolete, represented by four costal spots on the outer half of the wing.

Length of body, ♂, 0.15; of fore wing, ♂, 0.75; expanse of wings, 1.60 inches.

Labrador, Moravian Missions (Moeschler); Saint George's Bay, Newfoundland, "flew aboard in numbers September 26, 1874" (Mr. J. Milner); received from Mr. R. McLachlan.

This species differs from the others by its large size and simple antennæ. It will undoubtedly be found in the mountainous and boreal regions of North America, as it seems to be common in Newfoundland and also in Labrador, and can scarcely be regarded as an imported species. My examples do not differ materially from European ones. Its range in Europe is set down by Staudinger as follows: Northern and Central Europe; Piedmont; Ural Mountains; Armenia; Amur; Lapland.

To the synonyms given above may be added the following from Guenée, which I have been unable to verify: *ventilata* Fabr. 226, *autumnata* 132, *impluviata* 131, *quadrifasciata* 133, *affiniata* 134, *carpinata* 135! Bork., *inscriptata* Donovan., *fimbriata* Haw., *neglectata* Steph. It is called in Europe the November moth.

Larva.—"The head of the caterpillar is rather narrower than the body, and not notched on the crown; the body is stout, velvety, and cylindrical; the colour of the head is dull-green, the mouth tinged with purple; the body is apple-green above, but liable to great variation, purple markings sometimes appearing on all the segments; the back of the second segment, and a median line on the tenth, eleventh, and twelfth segments, are often of this colour, and the thirteenth segment is generally tinged with purple; there is, moreover, a white stripe just below the spiracles; the body is glaucous or blue-green; the legs are pale transparent-green, the claspers of nearly the same colour, but often tinged or blotched with purple. It feeds on white-thorn, black-thorn, horn-beam, sloe, oak, and almost every forest tree, and is full-fed in June."—Newman's British Moths, 109.

THERA Stephens. Plate 1, fig. 5.

Dysstroma Hübn. (in part), Verz., 333, 1818.

Pelurga Hübn. (in part), Verz., 335, 1818.

Chesias Treits. (in part), Schm. Eur., vi (i), 330, 1827.

Dup. (in part), Lep. France, viii (v), 497, 1830.

Thera Steph., Ill., iii, 271, 1831.

Cidaria Boisd. (in part), Gen. et Index, 213, 1840.

Chesias Boisd. (in part), Gen. et Index, 213, 1840.

Melanthia Boisd. (in part), Gen. et Index, 217, 1840.

Larentia H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Thera Steph., Cat. Br. Lep., 196, 1859.

Guen., Phal., ii, 370, 1857.

Walk., List Lep. Br. Mus., xxiv, 1260, 1862.

♂.—Head rather fuller and wider in front than in *Petrophora*. Antennæ and palpi as in *Petrophora*, the latter being long and pointed, rather bushy,

the third joint slender and acute: they project as far beyond the front as in *Petrophora*. Fore wings much as in *Petrophora*, the convexity of the costa the same, and the apex subacute. The hind wings are of the same shape as in *Petrophora*. The venation differs decidedly, the first three subcostal venules being much shorter than in any other genus of the subfamily except *Hydriomena*; the origins of these venules are equidistant, the origin of the second subcostal being situated half-way between the end of the outer subcostal cell and the origin of the third venule. There are two subcostal cells, the inner one usually much smaller than the outer. The origin of the first median venule is rather remote from the second, much as in *Lobophora*. Hind wings as in *Petrophora*. Hind legs with the tarsi as long as the tibiae; the first joint of the tarsus nearly as thick as the tibiae. Coloration like that of *Petrophora*, but with a narrow median band on the fore wings.

This genus chiefly differs from *Petrophora* in the venation, and the fuller front of the head, and the coloration. The venation is much as in *Hydriomena*, and is so different from *Petrophora* as to forbid uniting it with that genus.

Larva.—"Quite short and slender, a little swollen anteriorly, with very distinct lines; head large, subglobular, bordered with the prothoracic shield; anal points very distinct; living on conifers. *Pupa* green; in cocoons of silk, among leaves."—(Guenée.)

Thera contractata Packard. Plate 8, fig. 28.

Cidaria (Thera) contracta Pack., Fifth Rep. Peab. Acad. Sci., 56, 1871.

3 ♂.—Palpi, head, and thorax, as well as wings, pale cinereous: base of fore wing with scattered black scales, and two angled, parallel, black lines, the outer heavier, and marked with longitudinal stripes on the venulets; beyond, a broad, pale band, of very uniform width, slightly angled on the median vein; beyond, a mesial band margined with black, narrowing more than usual on the inner margin, where it is less than one-third as broad as on the costa, and the two black margins meet, forming two contiguous black patches. In front, the band encloses obscure ringlets of cinereous; the sides are more broadly dark on the costa; discal dot black; beyond, an obscure, pale patch; margin with a zigzag white line, the acute scallops enclosing dark dots; edge of both wings with the usual black dots, and fringe concolorous with the rest of the wing, and hind wing uniform pale cinereous, with

two dusky lines. Beneath, dusky on basal two-thirds; discal dots distinct, outer one-third luteous; pale, with the pale zigzag line on costal half, and on hind wing two distinct, dusky lines.

Length of body, 0.40; length of fore wing, 0.45; expanse of wings, 1.00 inch.

Brunswick, Me. (Packard); Portland, Me. (Morse, Mus. Comp. Zoöl.).

Easily known by the narrow, dark, mesial band, black and very narrow on inner edge, and the pale, zigzag line re-appearing beneath; also, on fore wing, a black streak near apex, and a smaller apical black dot. It is closely related to the European *Thera juniperata*.

HYDRIOMENA Hübner. Plate 1, fig. 6.

Hydriomena Hübn. (in part), Verz., 322, 1818.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 5, 1828.

Ypsipetes Steph., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 138, 1829."

Larontia Dup. (in part), Lep. France, viii (v), 358, 1830.

Euthalia Steph. (in part), Ill., iii, 252, 1831.

Cidaria Böisd. (in part), Gen. et Index, 212, 1840.

Larontia H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Hydriomena Steph., Cat. Br. Lep., 195, 1850.

Ypsipetes Guen., Phal., ii, 376, 1859.

Walk., List Lep. Br. Mus., xxiv, 1266, 1862.

♂ and ♀.—Head rather larger and a little wider and fuller between the eyes than in *Petrophora*. Palpi long and porrect, pointed, beak-like; the hairs close; the entire appendage rather stouter than in *Petrophora*, and fully as long. Antennæ of male ciliated. Fore wings rather longer and often narrower, with the apex not subfalcate, as usual in *Petrophora* and other genera of the subfamily, but the apex is obtuse; outer edge oblique, as in *Petrophora*; hind wings shorter than in *Petrophora*, and much more produced toward the apex. Venation: two large, equal, subcostal cells; the subcostal venules very short, shorter than in any other genus except *Thera*; the second subcostal venule co-originating with the fifth on the other side of the main vein. The discal venules well marked; the posterior bent. Abdomen rather stout, ending in a broad tuft of hairs, rather shorter than in *Petrophora*. The hind legs with the tarsi as long as the tibiae. In coloration, this genus differs decidedly from *Petrophora* by the greenish hues, often turning dull red, and the broad smoky bands alternating with the grayish and greenish bands, which are bounded by black lines, and are irregular, wavy. The

apical, oblique, black line is distinct and often dislocated. There are usually two parallel dusky bands on the hind wings.

The species are distinguished from those of *Petrophora* by the oblong wings, unusually obtuse at the apex, the hind wings scarcely extending beyond the tip of the abdomen, by the broad tuft at the end of the abdomen, and the unusual style of coloration as well as the unusual venation.

This genus as developed in North America contains both of the two common European species and three others besides, so that this country may be looked upon as the center of distribution for the northern hemisphere.

Larva.—"Quite short, cylindrical, thick, a little moniliform, with numerous conspicuous lines; head small and globular; living exposed on trees and shrubs."

Pupa.—"Contained between leaves."—Gueneé.

Synopsis of the Species.

A. Fore wings with the bands edged with black, oblique, and wavy lines:

- Fore wings oblong; apex rectangular; bands bordered with greenish *H. trifasciata*.
Fore wings pointed; bands usually bordered with reddish *H. californiata*.

B. No black lines; wings crossed by several distinct, smoky, or white lines:

- Fore wings pointed; a marginal smoky line, olive-green, or reddish *H. soedadata*.
Fore wings with apex rectangular, brown, with five distinct smoky bands; margin of wing not smoky *H. 5-fasciata*.
Fore wings black, with five conspicuous white bands *H. spuriolata*.

HYDRIOMENA TRIFASCIATA Packard. Plate 8, fig. 29.

"*Geometra trifasciata* Bork., Eur. Schim., v, 308, 1791.

"*Geometra impluvata* Den. and Schitt., Verz., 109, n. Cat."

"Hübner, Schim. Eur., 223 (*post* 1797)."

Acidalia impluvata Treits., Schim. Eur., vi, n. 21, 1828.

Ypsipotes impluvata Steph., Nomencl. Br. Ins., 41, 1829; "Cat., n. 1829."

Larentia impluvata Dup., Lep. France, viii (v), 421, pl. 200, fig. 3, 1830.

Euthalia impluvata Steph., Ill., iii, 254, 1831.

Cidaria impluviaria Boisd., Gen. Ind., 214, 1840.

Larentia impluviaria H.-Sch., Schim. Eur., iii, 168, 1847.

Hydriomena impluvata Steph., Cat. Br. Lep., 195, 1859.

Ypsipotes impluvata Guen., Phal., ii, 377, 1857.

Ypsipotes pluvata Guen., Phal., ii, 378, 1857.

Ypsipotes impluvata Walk., List Lep. Het. Br. Mus., xxiv, 1267, 1862.

Ypsipotes pluvata Walk., List Lep. Het. Br. Mus., xxiv, 1268, 1862.

6 ♂ and 4 ♀.—Palpi long and slender; fore wings rather short and broad, and apex more rectangular than in any of the other species. Body and wings light-gray. Fore wings light-gray, with a pale greenish tinge.

Scotland, and Ireland in May; and Stanton records it as found only in May in England.

Larva.—In Europe, the larva feeds on the alder (Stainton's Manual). "The caterpillar is stout and obese; it conceals itself during the day in a rolled-up leaf of the alder, in which it feeds exclusively by night. Its color is dingy yellow, with a medio-dorsal and two lateral lines of a glaucous green."—Newman's British Moths, 153.

HYDRIOMENA CALIFORNIATA Packard. Plate 8, figs. 30, 32, 33.

Hypsipotes californiata Pack., Proc. Bost. Soc. N. H., xiii, 396, 1871.

Cidaria bistriolata Zeller, Verh. Z.-B. Ges. Wien., xxii, 433, 1872.

Cidaria glauca Pack., Proc. Bost. Soc. N. H., xvi, 20, pl. 1, fig. 6, Jan., 1874.

12 ♂ and 6 ♀:—Fore wings more produced toward the apex, outer edge more oblique, and the whole moth rather larger than *H. trifasciata*. Reddish ash-gray, usually with a decided brownish tinge. Front of the head pale ash; palpi long, brown, pale on the edges. Eyes black; tegulae pale ash, speckled with black. Base of fore wings reddish; an oblique, black, basal line finely and acutely pointed on the median vein (sometimes the angle is wanting) goes obliquely outward; it is bordered within with reddish; this, with an irregular black line crossing the wing obliquely just before the discal dot and bordered within with red, forms a dark band crossing the wing and enclosing a median white or whitish-ash band; a dark, irregular, black, extradiscal line forming a great angle on the last subcostal venule, where it is connected with an oblique, black, apical, broken line, and joining a dark patch or tuft of cilia just beyond the middle of the inner edge; between this and the median line is a clear reddish-ash area, narrow on the inner edge of the wing, and three times as wide on the costa, and enclosing a linear, long, black, discal dot; this extradiscal line is broadly bordered externally and internally with reddish-brown, which is followed by a watery-ash band indented on the venules; beyond, the wing is dark ash, the fringe concolorous; the oblique, black, apical line consists of three or four longitudinal spots. Hind wings rather paler and of the same color beneath, with a single, extradiscal, dusky band, sometimes wanting. Fore wings considerably darker beneath.

Length of body, ♂, 0.50–0.58, ♀, 0.50; of fore wing, ♂, 0.55–0.70, ♀, 0.62–0.65; expanse of wings, 1.05–1.40 inches.

Albany, N. Y. (Lintner, 2805); Philadelphia, Pa. (Amer. Ent. Soc.); West Virginia, April 27 (Mead); Southwestern Kentucky (Kentucky Geo-

logical Survey, F. G. Sanborn); Central Missouri (Riley); Waco, Tex., March 16 (Belfrage); Grand Rapids, mouth of Saskatchewan, July 11 (Scudder); Rocky Mountains (Grote); Colorado (Mead); Dallas, Tex. (Boll. Mus. Comp. Zööl.); Victoria, Vancouver Island, July, common (Crotch, Mus. Comp. Zööl.); Albany, Oreg. (J. Holleman); California (Behrens); Mendocino City, Cal. (A. Agassiz, Mus. Com. Zööl.); Niles, Cal., February (Behrens); Sanzalito, Cal., January 6–26, February 9–16 (J. Behrens).

This is our most common form south and west of New England (where it is replaced by *H. trifasciata*), occurring in the Southern States in March and in the Middle and Western States in April and May. It differs from *H. trifasciata* by its longer fore wings, more pointed apex, and oblique outer margin, and its usually reddish instead of greenish bands, in the often more sinuate, smoky, submarginal band, and, in those specimens which most nearly approach *trifasciata*, *i. e.*, without reddish tints, the middle light band is narrower, while the arrangement of the markings is very much the same. The narrow and pointed fore wings are the best distinguishing mark. To *H. sordidata* it is closely allied in the shape of the wings, but differs entirely in the style of the markings; the latter not having the definite basal, middle, and extradiscal black lines which characterize *H. californiata* and *trifasciata*.

An interesting variety (pl. 8, fig. 32), named by Professor Zeller *Calaria bistriolata* has been received from Saint Louis, Mo., through Mr. Riley. It is a bred specimen, and in excellent condition. The black lines are heavy and almost suffused. The general tint of the wing is olive-green, with no lines or distinct markings of any sort between the middle band and the basal line; the middle band is nearly white, not reaching the costal edge, which is heavily lined with black, connecting with the apical line; the band is deeply scalloped, sending out a large two-scalloped projection in the middle of the wing, and below becoming very narrow, the points of the scallops on opposite sides in the submedian space nearly dividing the band into isolated round patches. A specimen from Kentucky bears a general resemblance to this, but the base of the wing and the median band have a distinctly yellowish tinge. A similar form also occurs in Texas. The specimen received from Mr. Riley was bred from a pupa found under bark April 26. I have compared Zeller's type (from Texas) in the Museum of Comparative Zoölogy with Riley's specimen, and find no difference between them.

In small examples, the median white band is apt to be very wide and

conspicuous, the species varying much in this respect as *II. sordidata*, so that the varieties of the two species are apt to be confounded; the variety of the present species being distinguished by the whitish outer edge of the fore wings, which in *II. sordidata* is smoky.

The large female specimen I described as *Cidaria glaucata* is a form of *II. californiata*. The head is whitish on the vertex and front; palpi ash-brown; antennae minutely ringed with white and brown. Thorax and fore wings pale glaucous-green. Fore wings with a brown squarish spot at base of submedian space; wing clear-green beyond, just within the middle crossed by a broad compound band, directed obliquely outward toward the middle of the inner edge; the band is made up of two filiform, slightly-sinuuated, blackish and red lines, enclosing, on each side of the median, wavy, smoky-gray band, a broad green band; beyond is a broad clear space; a much sinuate, submarginal, smoky band starts from the inner angle, and, after a long outward curve, ends on the costa (just below which it is dislocated), at a distance from the apex equal to the thickness of the thorax; some black and reddish scales are strewn along the edge of the band; from a squarish thickened portion, as if broken off from the band, reaches out toward the apical black streak a similar short black stripe; a marginal, narrow, thread-like, black line. Fringe whitish, dark at the ends of bands. Hind wings whitish, with two parallel, curved, slightly-scalloped, dusky lines, situated nearer the outer edge than usual. Both wings beneath pale-whitish, concolorous with the upper side of the hind wings, with very faint indications of two outer, parallel, dusky lines common to both wings. Legs brown, ringed with white.

Length of body, 0.60; of fore wing, 0.70 inch.

California (Edwards).

HYDRIOMENA SORDIDATA Packard. Plate 8, figs. 31, 34, 35.

Geometra sordidata Fabr., Ent. Syst., 185-1794.

"*Geometra rectangulata* Fabr., Systema Ent., 636, 1775; Ent. Syst., 195, 1794."

"*Geometra clutata* Hübner, Schum. Eur., 221 (post 1797), 382 ab., 384, 385 ab.;" Stand. Cat.

Acidalia clutata Treits., Schum. Eur., vi, (ii), 29, 1828.

Ypsipetes clutata Steph., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 1829."

Dup., Lep. France, viii (v), 426, pl. 200, figs. 1, 2, 1830.

Euthalia clutata Steph., Ill., iii, 254, 1831.

Cidaria clutaria Boisd., Gen. Ind., 214, 1840.

Laurentia clutaria H. Sch., Schum. Eur., iii, 168, 1847.

Hydriomena clutata Steph., Cat. Br. Lep., 195, 1850.

Ypsipetes clutata Guen., Phal., ii, 378, 1857.

Walk., Last Lep. Het. Br. Mus., xxiv, 1267, 1862.

Hapsipotes nubifasciata Pack., Proc. Bost. Soc. N. H., xiii, 398, 1871.

Hapsipotes albifasciata Pack., Sixth Rep. Peab. Acad. Sc., II, 1874; Proc. Bost. Soc. N. H., xvi, pl. 1, fig. 6, 1874.

♂ and ♀.—In the shape of the wings, this species closely resembles *H. californiata*; the apex being pointed, the outer margin very oblique, and the costa rather convex. The palpi, however, are shorter. Head, thorax, and fore wings olive-green (or, when faded, reddish-brown). Hind wings and abdomen pale-ash, with a dark dorsal abdominal line. Fore wings dark olive-green (or reddish instead), crossed by six smoke-colored bands. The basal line linear, directed obliquely outward, but not waved. This is succeeded by a smoky band, as broad as, or sometimes broader than, any of the others; it is curved regularly outward, with the edges quite regular. Just beyond, and situated just before the middle of the wing, is a narrow band, curved and sinuous, widening on the costa, and linear and wavy on the inner edge. On the outer fourth of the wing is a broad, slightly sinuous, smoky band, dentate on the outer edge except on the costa and inner edge; a broad, marginal, smoky band, with a row of intervenular, black, linear dots next to the fringe, which is dull-ash or smoke-colored, with a darker line, and checkered along the inner edge. Hind wings pale-ash, with two outer curved dusky bands, while the margin of the wing is dusky; a dark, oblique, apical streak, sometimes wanting. Beneath, the costa of the fore wings has five large, yellowish-white, square spots, alternating with dark ones, from which proceed obscure diffuse lines, corresponding to the smoky bands above. The margin of the wing is finely peppered with light scales. Hind wings pale-ash, with the lines faintly reproduced. Fore legs dusky, ringed with whitish; hind pair paler, like the abdomen.

Length of body, ♂, 0.46; ♀, 0.42; of fore wings, ♂, 0.62, ♀, 0.46; expanse of wings, 1.10 inches.

California (Behrens, Edwards, Mus. Peab. Acad. Sc., Riley and Morrison); Sanzálito, Cal., January 2–31, February 6–21 (J. Behrens).

This pretty form differs entirely from all the other species in the outer edge of the fore wings being broadly margined with smoke-color; in the second band from the base being very broad and smoke-colored; in the general distinct olive-green shade on the fore wings; and by the light large checks on the costa beneath. The markings are entirely different from those of *H. trifasciata* and *californiata*; and, in this respect, it approaches *H. 5-fasciata*. The green portion is often of a dull brick-red. One such specimen, on being

placed next to a similar example received from Iceland through Dr. Staudinger, labeled *Ypsipetes sordidata* Fabr. *var.*, is not distinguishable by any characters that I can see. Other Californian specimens with shorter fore wings do not differ much from the normal Iceland specimens, except in the general color; the green shade being replaced in the Iceland examples by dark reddish smoky-brown; the hind wings in the latter being darker than any American individual.

We shall look naturally for its occurrence in boreal Northeastern America. Staudinger gives the following localities in Europe in his Catalogue: Central and Southern Europe; Iceland; Piedmont; Italy; the Ural Mountains; and Amur.

In England, Scotland, and Ireland, Stainton and Newman report it as being common and very variable, appearing in July.

The interesting variety originally described as a distinct species under the name *Hypsipetes nubilofasciata* (pl. 8, fig. 31) not uncommonly occurs. The fore wings are yellowish-white, and crossed by nine bands: the linear basal line is directed obliquely outward from the costa, and sometimes irregularly edged on each side with reddish scales, and is waved and angulated in the median space. This is succeeded by a broad smoky band, widest in the middle; just beyond which is a curved smoky-black band, widening toward the costa and wavy toward the inner edge of the wing, and bordered on both sides with reddish scales. Parallel, and just beyond, is the extra-discal line, but a little narrower and less distinct (sometimes obsolete), and bordered on each side with reddish scales, which do not reach the costa. The median band is usually whitish, and varies much in width. Just beyond this is a broad, sinuate, smoky band, irregular on the edges. The outer edge of the wing is also smoky, forming a broad, marginal, smoky band; a blackish, oblique, apical streak. Beneath, the bands are very faintly reproduced on both wings; but their terminations on the costa of the fore wings form five large, square, dusky spots, alternating with light ones.

Specimens of *H. californiata* vary in much the same way as this; but it may be distinguished by the outer edge of the fore wings being smoky.

A rare and singular form (pl. 8, fig. 34), which I am, now that I have had more material for study, inclined to regard as a variety of the present species, was originally described by me as *Hypsipetes albifasciata*.

This singular variety is more nearly allied to var. *nubilofasciata* than

any other from California; but the fore wings are rather longer, the outer edge being more oblique. The hind wings are also rather longer than in var. *nubilofasciata*. Head and thorax pale-gray, with yellowish scales. Fore wings blackish, with dark olive-green as a ground color. Base of wing black; beyond is a dark olive-green space, with a few black scales; then a black band; farther toward the middle of the wing is a blackish Y-shaped band, the fork beginning just below the subcostal vein. Just beyond the middle of the wing is a broad, irregular, conspicuous, snow-white band, over twice as wide on the costa as on the inner edge of the wing; the band on the inner side is rudely sinuate, while the outer edge is nearly straight from the costa to the median vein, when it suddenly widens out into a cone, and below is irregularly scalloped. A submarginal smoky band. Hind wings smoky-gray as usual, immaculate. Beneath, fore wings dusky, blackish on the costa; the white band faintly re-appears as a little paler shade than the rest of the wing; beyond is a triangular, costal, pale spot. Hind wings with a discal dot and two curious dusky lines.

Length of body, 0.40; of fore wing, 0.63 inch.

California (Edwards and Behrings).

In one example from Sanzálito, the bands alternating with the smoky bands are yellowish-green instead of reddish; in another, the middle band, usually whitish or greenish, is bright brick-red.

It is a more common species in California than *H. californiata*, though both apparently are very abundant.

Larva.—The eggs are laid in July on several species of willow, *Salix caprea* and *S. cinerea* being preferred. The young caterpillars emerge in twelve days, and feed on the willow-leaves until half-grown, when they hibernate. In the spring, they begin to feed again as soon as the leaf-buds of the willow expand. They then grow very rapidly, and are frequently full-fed by the first of June. The full-fed caterpillar has a singular habit of secreting itself in the seed-down of the willow during the day, and of spinning this together in masses. It seems to feed principally during the night. When full-fed, it is an obese and lethargic caterpillar, which doubles itself up and falls from its food-plant if shaken or annoyed. The head is narrower than the body, scarcely notched on the crown; it is prorected in crawling. The body is rather depressed, and slightly attenuated anteriorly. The color of the head is clear-brown, rather glabrous; the cheeks are reticulated with

black; the lip is entirely black; the dorsal surface of the second segment brown and shining, that of the following segments pale-brown or smoky-black, of very varied tint in different individuals, but in each individual the tint of the dorsal area is pretty uniform as far as the spiracles; it is, however, intersected throughout by two distinct pairs of white stripes, the inner stripe of each pair being the broader and more distinct; both are irregular and interrupted, and just below the spiracles is a third white stripe, still more obscure and interrupted. This third stripe serves as a boundary between the dorsal and ventral area. The ventral area, anal flap, and claspers are testaceous-brown; the legs testaceous-brown, spotted with black. These caterpillars construct themselves cells in the down of the sallow-seed, and therein change to bright-brown and very glabrous chrysalids in the beginning of June. The caudal extremity of the chrysalis terminates in two setiform processes, which are approximate at the base, but divergent at the tip."—Newman's British Moths, 153.

HYDRIOMENA QUINQUE-FASCIATA Packard. Plate 8, fig. 36.

Hypsipetes 5-fasciata Pack., Proc. Bost. Soc. N. H., xiii, 397, 1871.

Hypsipetes viridata Pack., Proc. Bost. Soc. N. H., xvi, 21, 1874.

6 ♂ and 3 ♀.—Of the ash-gray color usual in the genus, though rather darker than usual. Body and wings colored alike; two dusky spots on the prothorax, and two on each patagium. The fore wings are crossed by five dark-brown bands; the basal one goes obliquely outward from the costa to the inner edge, being angulated on the median vein. Beyond is a band twice as broad, dislocated in the median space; beyond, and close to the preceding, is a band half as wide, and crossing the wing just before the middle. Just beyond it is a faint linear discal mark, more distinct in the female than the male; the middle of the wing is clear. In the outer third of the wing is a narrow band, more or less scalloped like the others, and obtusely angulated outward; a distinct, broad, submarginal band, deeply scalloped on the outer edge, the scallops being deeply pointed; the band increases in width toward the costa; the usual oblique apical streak partially conceals one of the scallops, being very well marked; outer edge of wing ash, not smoky. The veins and their branches are black on the bands. Hind wings light-ash, crossed by two faint bands, and not sprinkled over with black scales, as in the preceding species; a very faint discal dot.

Beneath, uniformly ash; the bands and discal spot very faintly repro-

duced, more distinct on the costa; the discal dot on the hind wing quite distinct.

Length of body, ♂, 0.50, ♀, 0.57; of fore wing, ♂, 0.61, ♀, 0.68; expanse of wings, 1.30 inches.

California (Edwards and Behrens); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.); San Francisco, Cal. (A. Agassiz, Mus. Comp. Zool.).

Differs from *H. sordidata* in the quite different arrangement of the bands, which are of a peculiar smoky color, not reddish, and appearing as if translucent; by the outer edge of the wing not being smoky; and by the rectangular apex. The wings in some specimens have a decided reddish tinge to the brown. Two specimens from Vancouver Island are exactly like the Californian; in another, the ground-color of the wings is Scotch-snuff colored. Rubbed specimens show the bands very distinctly.

A peculiar, green female, received from California through Mr. Behrens, differed so much from the others that it was described as distinct under the name of *Hydriomena viridata*. I append a description of this interesting variation. It was in a perfect state of preservation, and closely allied structurally and as regards size to the ordinary form, the palpi being long, and extended as far in front of the head as the latter is long; the outer edge much as usual, being less oblique than in some other species; the third subcostal interspace is narrower than in the other specimens. Head, thorax, and fore wings deep sea-green, mixed with dull, dark, smoky-ash, and some yellowish-green and a few black scales. Palpi with no green scales, but black and pale ash, being darker below than above. Antennae finely ringed with white and blackish. Fore wings of a sea-green ground-color, with numerous fine, transverse strigae, crossed by five clear, smoky-ashen, sinuous bands, finely edged with black; the basal very short and narrow, close to the base of the wing; the second line is narrow, ends farther from the base of the wing on inner than on costal edge, and is angulated outward conspicuously on median vein. The third band is close to, and parallel with, the second, and twice as wide; it is bent outward on the median and submedian veins. A fourth, faint, narrow band, close to third. The fifth, or submarginal line, is twice as broad as third, and very remote from the latter (which is within the middle of the wing); it is nearly straight on the inner edge, though curved outward just below the costa, while the outer edge is deeply

and subacutely scalloped between the venules much as usual: the band is half as wide on the inner edge as on the costa. Fringe on both wings with a faint median line. Hind wings smoky, with two transverse, parallel, dusky lines. Beneath much as usual, being smoky-ash, with two dusky bands on both wings beyond the middle, broadest and darkest on costa, less curved and farther apart, and farther from outer edge than usual. A faint discal dot, better marked on hind wings. Abdomen and legs nearly concolorous with hind wings.

Length of body, 0.52; of fore wing, 0.67 inch.

HYDRIOMENA SPECIOSATA Packard. Plate 8, fig. 37.

Hypsipotes speciosata Pack., Proc. Bost. Soc. N. H., xvi, 22, 1871.

2 ♂.—This is by far the largest and most showy species of this genus yet known to us. Body pale-ash, with a luteous tinge: palpi long, brown. Fore wings pale-green, arranged in broad bands, alternating with equally broad, blackish bands, varying as usual in width. The green band in the middle of the wing is partly or almost wholly white. Six unusually distinct black bands: the insertion of wing black: the first band beyond very narrow, and bent outward on the median vein: the second very broad and more regular than those beyond, bent outward at right angles in the discal space: the whitish line is edged on each side by blackish, interrupted lines, the spots varying much in size. The submarginal band also dislocated, and very irregular, bordered internally with whitish: this band is merged toward the apex with the marginal band, consisting of a row of triangular spots. Fringe dark brown. Beneath, costa paler than rest of wing, with five large, square, dark brown, conspicuous spots. Hind wings smoky-gray beneath, with two broad, submarginal, dusky bands.

Length of body (not including palpi), ♂, 0.54; of fore wing, ♀, 0.73; expanse of wings, 1.40 inches.

Mendocino City (A. Agassiz, Mus. Comp. Zool.).

This showy species may be identified by the black and green bands on the fore wings, the more or less whitish central band, and by the large, square, costal spots on the under side. In one specimen, the margin of the fore wing is almost wholly black, with a short vein of whitish-green spots.

PETROPHORA Hubner. Plate 1, fig. 7, 7*a*, 7*b*.

- Petrophora* Hubn., Tent., 1810, *antarche*.
Chloroclasta Hubn., Verz., 332, 1818.
Amela Hubn., in part., Verz., 333, 1818.
Dysdercus Hubn., in part., Verz., 333, 1818.
Pachycro Hubn., in part., Verz., 335, 1818.
Lampro Hubn., Verz., 335, 1818.
Lepus Hubn., in part., 335, 1818.
Lacerta Fritsch, in part., Schin. Eur., vii, fig. 75, 1828.
Calaria Fritsch, in part., Schin. Eur., vii, fig. 140, 1828.
Harpalus Steph., in part., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 131, 1829."
Steganocephala Steph., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 135, 1829."
Electra Steph., in part., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 135, 1829."
Calaria Dup., in part., Lep. France, vii, xv, 298, 1830.
Harpalus Steph., in part., Ill., iii, 229, 1831.
Polyphassa Steph., in part., Ill., iii, 227, 1831.
Steganocephala Steph., Ill., iii, 232, 1831.
Lampropteryx Steph., in part., Ill., iii, 233, 1831.
Electra Steph., in part., Ill., iii, 238, 1831.
Calaria Borsd., in part., Gen. Ind., 212, 1840.
Larania H. Sch., in part., Schin. Eur., iii, 141, 1847.
 Not *Calaria* Steph., Cat. Br. Lep., 189, 1850.
Electra Steph., in part., Cat. Br. Lep., 189, 1850.
Harpalus Steph., in part., Cat. Br. Lep., 190, 1850.
Steganocephala Steph., Cat. Br. Lep., 1850.
Lampropteryx Steph., in part., Cat. Br. Lep., 193, 1850.
Polyphassa Steph., Cat. Br. Lep., 195, 1850.
Lygus Led., Verh. Bot. Zool. Ges. Wien., 252, 1853.
Calaria Led., in part., Verh. Bot. Zool. Ges. Wien., 253, 1853.
 Guen., Phal., ii, 456, 1857.
 Walk., List Lep. Br. Mus., xxv, 1376, 1862.

The head is rather narrow, and not very full between the eyes, with a slight interpupal tuft; palpi large and long, sometimes projecting beyond the head a distance equal to the length of the head; second joint extending nearly its whole length beyond the front, broad at the end, the scales spreading somewhat; third joint long and slender, acute, not so long as the second joint is wide. Male antennae flattened, ciliated, never pectinated. Fore wings usually distinctly falcate, the costa full, considerably arched toward the acute apex, which is a good deal produced, while the outer edge is unusually full and rounded and nearly as long as the inner edge. Hind wings of the usual shape, scarcely extending beyond the end of the abdomen; the apex produced, obtuse; the outer edge full and rounded. The venation is more rudimentary than in any other genus of the family; the discal venules either entirely wanting (*P. truncata*, fig. 7) or incomplete (*P. diversilimata*, fig. 7*a*), not reaching far from their respective origins; there is sometimes one subcostal cell (*P. flavo-rupe*, fig. 7*b*), but more usually two, the inner

being sometimes very small (*P. truncata*, fig. 7), or the two are nearly equal (*P. diversilineata*, fig. 7a); the subcostal venules are long, subparallel with the costa, and are arranged much as in *Glaucopteryx*, the second subcostal arising midway between the first and third; when present, the anterior discal venule is much curved outward, and the posterior venule is bent at a high angle. Hind legs with the tarsi as long as the tibiæ. Abdomen very long and slender, ending in a conical tuft, with dorsal and lateral projections. Coloration: either gray, with numerous zigzag bands, and an apical, light, zigzag streak, shaded with dark beneath, or some shade of black or yellow ochreous, with fine dark lines enclosing squares and triangles. On the hind wings are usually two rudimentary lines.

The species of this large genus have a style of coloration and facies that enable them to be distinguished from *Glaucopteryx* on the one hand and *Ochyria* on the other. From the former genus, it differs in the more decidedly falcate fore wings, the narrower head, stouter, longer palpi, and smaller, shorter hind wings. From *Ochyria*, it differs in the antennæ always being ciliated, the cilia being short, in the much longer palpi, and in the much more falcate fore wings, while the species are usually much larger. The natural divisions of the species of the United States are indicated in the synopsis of the species.

Larva.—"Elongated, smooth, slender, stiff (*raide*), pedunculiform, not attenuated anteriorly; with the head larger than the neck [prothoracic segment], flattened in front, and often bifid at the summit; living on trees or shrubs."

Pupa.—"Of various colors, spotted or punctuated."—(Guenée.)

The characters of the larva of our *P. diversilineata* agree with those quoted above from M. Guenée's work.

SYNOPSIS OF THE SPECIES.

Atlantic and Circumboreal.

A. Species small, with an oblique apical streak, and no cloud beneath:

Fore wings with two russet-brown bands	<i>P. truncata</i> .
Fore wings with two yellowish bands	<i>P. hersiliata</i> .

B. Species larger, with a triangular dark patch under the oblique apical streak:

- Pale ash fore wings, with two whitish bands; middle band scarcely projecting; tip of male abdomen mucronate *P. canaliculata*.
 Brownish-ash, with distinct tan-brown bands; subapical patch large and distinct; scallops of outer edge of discal line angular and large, especially those of the three-toothed projection *P. prunata*.

C. Apex very square; fore wings with the outer edge of middle line running straight out from costa, with no scallops, and forming a more or less falcate angle:

- a. Black-brown, with clear-white lines, forming black squares and triangles; thorax striped with white:
 Size small; angle much rounded; no costo-apical triangle *P. albulicincta*.
 Larger; angle acute, with costo-apical triangle and oblong patches within. . . *P. atricolorata*.
 b. Large; bright ochreous-yellow:
 A subapical deep-ochreous patch, angle rounded; middle band broad, uninterrupted, edged with white. *P. testata*.
 Larger than *testata*; apex more pointed; a subapical dark patch; middle band broad, dark on the sides; a broad dark basal band *P. populata*.
 Outer angle of middle band very acutely falcate, nearly reaching outer edge of wing; lines brown, linear, forming an oblong area in inner third of the wing, and a triangular area on middle of inner edge of wing *P. diversilicincta*.

Pacific.

- Diminutive; inner edge of middle band acutely bent toward middle of wing. *P. bonineta*.
 Larger; inner side of middle band straight; both wings bright-ochreous beneath. *P. manipata*.
 Wings not angulated, yellow, with a broad marginal shade, and a subtriangular spot on the hind wings. *P. flavicincta*.

PETROPHORA TRUNCATA Packard. Plate 8, figs. 38, 39, 40.

"*Geometra truncata* Hübn., Berl. M., iv, 692, 625, 1769."

"*Geometra centumnotata* Schultz, Naturt., vi, 93, iv, 1, 1775."

"*Geometra russata* Den. et Schiff., Verz., 113, 1776."

"Borkh., Eur. Schm., v, 105, 1794."

"Hübner, Eur. Schm., 305, 1796."

Dysstroma russata Hübn., Verz., 333, 1818.

Cidaria russata Treits., Schm. Eur., vi (iii), 189, 1828.

Dup., Lep. France, viii (v), 324, pl. 193, fig. 1, 1830.

Polyphasia centumnotata Steph., Ill., iii, 239, 1831.

Cidaria russaria Boisd., Gen. Ind., 211, 1840.

Larentia russaria H.-Sch., Schm. Eur., iii, 172, fig. 189, 1847.

Polyphasia russata Steph., Cat. Br. Lep., 196, 1859.

Cidaria russata Guen., Phal., ii, 464, 1857.

Walk., List Lep. Br. Mus., xxx, 1389, 1862.

Cidaria brunnata Pack., Proc. Bost. Soc. N. H., xi, 47, 1867.

10 ♂ and 6 ♀.—Palpi long; fore wings much produced toward the acute apex; the costa being rather more curved than usual toward the apex.—Abdo-

men slender, acutely conical at tip. Body brown-ash (sometimes quite pale). Fore wings pale-ash; base of wing dark, especially toward the basal line, which is curved outward in its general course; it is very zigzag, with a sharp tooth projecting outward just behind the costal edge, a much larger, sharp, jagged tooth in the discal space; just below the median vein is a smaller, blunter tooth; the line sends an angle inward on the internal vein, being directed outward, where it ends on the inner edge; beyond is a broad, distinct, russet-brown band, varying in width and curved outward in its general course (the brown shade is often wanting, and the band is concolorous with the rest of the wing); the outer edge of the band is very zigzag, there being an acute tooth above and just below the subcostal vein, and another large tooth in the submedian space; it is bent outward on the inner edge; the outer edge of this brown band forms the inner edge of the broad median band, which is paler in the middle, concolorous with the rest of the wing, and with two central lines, converging as usual below the median vein, and forming three ringlets; on the sides, the band is blackish, especially so on the front half of the outer edge, where it forms a broad, oblong, black patch. Discal dot usually distinct; the outer edge of the band sends a broad jagged projection along the first median venule, the distance from the point to the edge of the wing being a little greater than the thickness of the thorax; from the costa to this point, the line is directed more or less, usually very, obliquely outward; just below the subcostal vein is a sharp sinus, followed by an acute angle on the independent venule; in the discal and first median spaces, each, is a large tooth, the lower one narrower, and both much smaller, and forming a more pointed projection than in *P. prunata*; below this projection, the line retreats either very obliquely, without much of a curve inward, or with a decided curve; the line is usually scalloped; a long scallop in the second median space, but not projecting beyond the base of the scallop in front of it; the line is edged externally with white. Beyond the median band is a broad, distinct, russet-brown band, when obsolete leaving a large, subapical, brown patch (sometimes the brown band is entirely wanting); a submarginal, zigzag, white line, the angles smaller, less distinct, than in *P. prunata*; the white points are succeeded by a marginal row of black triangular points; a distinct, oblique, black, apical line, with no dark cloud below as in *prunata* vars. *lugubrata*, *destinata*, and *P. mucronata* (in this and some other respects the species approaches *Hydriomena*); the marginal black line is divided into

two dots in each interspace. Fringe ash colored, sometimes checkered, and often with a dark line within the middle. Hind wings clear smoky-pale ash, with a single, obsolete, much-curved line, usually represented by an obscure row of venular dots; sometimes a diffuse, faint, submarginal line. Beneath, finely dusted with brown; the discal dots distinct; two parallel extradiscal lines, the inner often absent, the outer is the reproduction of the outer line above, and bent and scalloped as above; a dark apical cloud; the marginal line and checkers in the fringe more distinct than above. On the hind wings, three much-curved lines, the two inner scalloped anteriorly. Legs dark, ringed narrowly with white. Abdomen with twin black spots on each segment, edged behind with white.

Length of body, ♂, 0.42-0.50, ♀, 0.45-0.48; of fore wing, ♂, 0.55-0.64, ♀, 0.63-0.70; expanse of wings, 1.05-1.25 inches.

Caribou Island, Straits of Belle Isle, Labrador, August (Packard); White Mountains, New Hampshire, September 29, Tuckerman's Ravine (Shurtleff, Mus. Bost. Soc. Nat. Hist.); White Mountains, August 20-30 (Scudder); New Hampshire (Dodge); Deering, N. H., August 18 (Cassino); New Hampshire (Harris Coll.); Mount Ascutney, Vermont, August (Sanborn, Mus. Bost. Soc. Nat. Hist.); base of Mount Katahdin, Maine, August 15; Brunswick, Me. (Packard); Salem, Mass., August 31, September 23 (Cassino); Amherst, Mass., September 20, (L. W. Goodell); New York (Mead and Smith); Trenton Falls, N. Y. (Osten-Sacken, Mus. Comp. Zool.); Pennsylvania (H. Sachs); Missouri (Riley); California (Edwards); Sanzailien, Cal. (Behrings); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.).

This is an exceedingly variable species in this country as well as in Europe; but it may usually be recognized by the acute fore wings, with the inner and outer russet-brown bands, the acute jagged projections of the outer line extending out farther than usual; by the oblique, black, apical streak, and the want of any cloud beneath the line. It is nearest allied to *P. bersulata*, from which it differs in the more acute fore wings, the russet brown bands, and the large projection of the outer line. In some specimens, however, the direction of the outer line is much as in *bersulata*. A common variation is in the absence of the brown bands, and in the size and extent of the large projection of the outer line and the depth of the scallops. Sometimes the line between the projection and the costa is quite direct in its course, and the

scallops or points small; at others, the scallops form deep re-entering angles, and acute, needle-like points. The extremes of variation are shown in a single Labrador and a single Californian specimen. In the latter, the middle band is much less angulated than usual, much as in *hirsiliata*, being broad and with shallower scallops, and, as in that species, the apex of the wing is squarer than usual; the body is of the usual size, but the fore wings are shorter, measuring 0.55 inch in length. It has the brown bands; and I should not call it a true variety.

The Labrador form, from Caribou Island, is much like a specimen from Iceland, labeled *Cidaria truncata* by Staudinger, but is much smaller. I had described it as distinct, but am now, after a careful study of the species, inclined to regard it as a variety, and describe it as follows:

Var. *brunneata* Packard.—(Plate 8, fig. 39.)—Male antennae filiform, long and slender, minutely ciliated beneath; basal joint white. Palpi short and small, rather hairy, a little up-curved, scarcely passing beyond the front, which is cinereous, with dark scales. Thorax cinereous, with dark scales; abdomen paler cinereous. Wings quite uniformly dark-ashen; a subbasal, irregular, brown band, whitish on the costa, and edged with whitish below; a broad, mesial, dark cinereous band, three times as broad on the costa as on the inner edge, with each side irregularly dentate; on the inner side a large tooth near the inner edge of the wing; on the outer edge, a large tooth situated on the first median nervure. Beyond is a broad, brown band, similar to the inner one, narrowed in the middle by the large tooth of the mesial band, margined with a paler line of acute spots, and becoming black on the costa; a minute, oblique, pale, apical streak; black spots on the margin as usual; fringe dusky; no discal dot; on the pale hind wings a discal spot, with two outer, submarginal, curved lines. Beneath, paler, subluteous on the outer third of the fore wings, like the entire surface of the secondaries, which have a submedian dusky patch, most distinct on the costa; fringe pale, interrupted with dusky. Legs dark, banded conspicuously with white.

Length of body, 0.35; of fore wing, 0.45; expanse of wings, 1.00 inch.

Caribou Island, mouth of Esquimaux River, Labrador, August 3 (Packard).

It may be known by its inner and outer broad, brown bands, margined externally with whitish, the inner band becoming whitish, the outer blackish, on the costa. Other specimens from the same locality are fully as large and exactly like White Mountain specimens.

Two Iceland specimens differ from any American, one in having the median band of a peculiar uniform dark-brown, with the russet brown band beyond; they are however, much like the var. *brunneata* from Labrador, though larger. Another Iceland example (expanse of wings 1.10 inches) is almost exactly like the Labrador ones (expanse of wings 1.30 inches), though rather smaller.

The species is most common in the White Mountains, though quite common about Brunswick, Me., on the sea-coast. The specimen from Missouri does not differ from the eastern examples.

A single specimen from California (Edwards) does not differ from New England specimens, except in some very slight characters, which I am disposed to regard as simply individual. Three large examples, the largest expanding 1.30 inches, were collected by Mr. Crotch in Victoria, Vancouver Island; they do not differ materially from the Californian individual. These are much more nearly allied to the Northeastern American forms than to some individuals from Iceland.

An interesting variety is represented on plate 8, fig. 49. It is paler than usual, with the basal third of the wing cream-white, interrupted by the basal dark band; the mesial band is rather pale, bordered with pale-brown beyond, much as usual. The hind wings are unusually pale. Standinger gives the following geographical distribution of this species in the Eastern Hemisphere: Central and Northern Europe; Central and Northern Italy; Atlas Mountains; and Eastern Siberia.

Having received a specimen of *P. immanata* from Professor Zeller, I can scarcely see on what grounds it should be regarded as distinct specifically from *P. truncata*, though it may be a well-marked variety. It is possible that it is a seasonal dimorph, as it (*immanata*) hibernates in the egg state, and the ordinary *truncata* in the larva state, according to Newman. I have a specimen from Deering, N. H., which closely approaches it. Newman remarks that, in England, "*C. russata* appears in May, and again in August: the May moths being the parents of the August moths. *C. immanata* appears in July: thus the single brood of *C. immanata* is intermediate between the two broods of *C. russata*."

This species is uniformly double-brooded in England.—(Newman.)

Larva.—The eggs which produce the spring brood are laid about the middle of August: those which produce the autumnal brood are laid about

the middle of May: the caterpillars from this second brood hibernate, or rather live through the winter, feeding at intervals when the weather is mild: the egg is flattish, or depressed on the crown, and of a dingy-yellow color, 'resembling that of a pale-tinted chip-box': it is laid on the leaves of wild strawberry (*Fragaria vesca*), and also, according to Guenée, on birch and white-thorn, and, according to Mr. Hellins, 'on willow.' The young caterpillars emerge about fourteen days after the egg is deposited, and are at first of a dirty-white, but soon acquire a green tinge, which continues to increase as they advance toward maturity. When full-fed, this caterpillar usually rests in a straight position, but, when annoyed or disturbed, tucks in its head, bringing it in close contact with the legs, thus causing the anterior half to assume the volute form. The head is about the same width as the second segment, not notched on the crown, and slightly hairy. The body is almost uniformly cylindrical, but somewhat restricted immediately behind the fourth segment, which is produced ventrally into a lump, on the summit of which are seated the third pair of legs. The thirteenth segment below the anal flap is produced into two parallel, 'acutely-pointed,' processes, directed backward. The color of the head is pale opaque-green, with conspicuous black ocelli. The body is pale yellow-green, with a medio-dorsal stripe, narrow and indistinct, of a darker, duller green; there is also on each side a paler stripe, equally indistinct; and in many specimens, below this subdorsal stripe, is a lateral, but often interrupted, rosy-red or purple stripe. This red stripe is accurately described by Guenée, and Mr. Doubleday assures me it is of common occurrence. The transverse skin-fold at each segmental division is yellowish, and over the entire surface of the body are scattered minute, white warts, each of which emits a slender hair, and is surrounded by an area slightly darker than the prevailing ground-color. The anal points are generally tipped with rose-color, and the legs and claspers are tipped with purple. When full-fed, it spins a leaf together with a few slight threads, in the manner of a spider's net, and in this flimsy retreat turns to a delicately-green, semi-transparent chrysalis.

The moths appear in May and August, and are common in England, Scotland, and Ireland. *C. russata* certainly hibernates in the caterpillar state; but *C. innominata* passes the winter in the egg state. The caterpillar of *C. russata* is dull-ochreous at first, but afterward brightish-green, and often ornamented with red on the sides. The caterpillar of *C.*

immanata is bright yellow at first, but afterward dull green, and never ornamented with red on the sides. Mr. Heli is also says that the anal veins are acute in *C. rufasata*, obtuse in *C. immanata*. "The eggs are laid in August on the leaves of *Fragaria vesca*, on which the larva feeds." Newman's British Moths, 1861.

PLETHORHORA HERSILIATA Packard. Plate 8, figs. 41, 42.

Colania hersiliata Guen., Phal., ii, 464, pl. 20, fig. 8, 1857.

Larentia flammifera Walk. ??, Fast. Lep. Brit. Br. Mus., xxiv, 1184, 1852.

♂ and ♀.—Closely allied in the form of the head and body and shape of the wings to *P. truncata*, though the fore wings are less acute, and the outer edge a little less oblique; the hind wings are much the same. Fore wings blackish-gray at base, with two dark, parallel, toothed lines, the outer forming the outer edge of the space; it has a prominent tooth just below the subcostal, and again just below the median vein (sometimes this tooth is wanting, and the edge goes obliquely from the tooth just below the costa to the inner edge of the wing); beyond is a broad, bright, rusty-yellow band, varying much in width, being sometimes wider than the median blackish band, and sometimes only one-third or one-half as wide; the middle third of the wing is occupied with a conspicuous dark band, varying much in width and distinctness; it is either dark and uniformly colored, or paler and containing two nearly parallel, black, scalloped lines forming large ringlets behind the median vein; the inner edge of the band is sinuate, curving outward from the costa, and sending a deep sinus outward (away from the base of the wing), but inward toward the center of the band itself (sometimes this indentation is large and broad and the rest of the edge is broadly scalloped); the outer edge of the band is somewhat as in *P. truncata*; the edge is usually nearly straight near the costa, but makes a large, broad, rounded angle on the first median space, and then succeeds a deep, acute sinus below the third median vein; a deep sinus, either linear or broad and oblong (as figured by Guenée), is sent in toward the distinct black discal dot; a deep angle, sometimes acute, below the third median vein, from which the edge curves outward and is twice scalloped; beyond the edge is a rusty-yellow band, scalloped externally, the scallops filled in with deep russet and black, with two large, rather acute teeth opposite the deep discal sinus in the median band (sometimes the yellow shade is wanting below these scallops

where the band expands); the band is limited externally by the submarginal, white, zigzag line; an oblique, blackish, apical streak, succeeded by a row of submarginal linear dots; the marginal, black, interrupted line distinct; fringe gray, with a mesial darker line, and checkered with dark gray opposite the ends of the venules. Hind wings whitish, with two faint outer lines, the inner of the two consisting of dark venular dots; discal dots distinct; beneath, the lines are faintly reproduced, the discal dots are quite distinct, and the costal half of the outer yellowish band faintly appears; the dark marginal line is distinct, and the dark checks in the fringe are darker and more distinct than above. On the hind wings, the inner line is distinctly scalloped. Abdomen with two rows of black spots.

Length of body, ♂, 0.45, ♀, 0.43; of fore wing, ♂, 0.55–0.60, ♀, 0.62; expanse of wings, 1.30 inches.

Mount Washington, N. H. (Sanborn, Mus. Bost. Soc. Nat. Hist.; July, Morrison); New Hampshire (Harris Coll.); Albany, N. Y. (Lintner, 68 and 2444); New Jersey (H. Sachs); Wisconsin (Mus. Peab. Acad.); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zoöl.); Canada (Guenée); Orilla, Canada; Trenton-Falls, N. Y. (Walker).

This species may be at once recognized by the two broad yellow bands on the fore wings, and by the deep discal sinus. It varies greatly in the contour of the outer edge of the basal space; the scallops being either slightly marked or acute and prominent. The width of the inner yellow band varies much, being one-half as wide in some as in others. The inner edge of the mesial band is scalloped with different degrees of distinctness, while the band itself is in some specimens three times as wide as in others. The depth and size of the discal sinus vary greatly, as also the form of the scallops and the depth and distinctness of the broad submedian sinus. The form of the fore wing in only one specimen approaches that indicated by Guenée, being very square at the apex. The two White Mountain specimens would easily be mistaken at first for different species: in one, the inner yellow band is half as wide as in the other, and the discal sinus is very small, while in the other very large; and the mesial band is twice as wide in one as in the other, with two distinct lines running through the middle of the space. The specimen (female) from Vancouver's Island differs most from the others in the basal yellow band being much wider than usual, with the edges irregularly and sharply scalloped; the outer yellow band is wanting, the outer third

of the line being whiter than usual, but the brown patches present in the other specimens and then clouding the yellow band are present; the median dark band is very narrow, and wants the discal and submedian sinuses so conspicuous in the other specimens. In size and the cut of the wing, the specimen does not show any varietal differences.

In one of two specimens received from Mr. Lintner (2441), the outer yellow band is wanting; in the other (68), the two bands are rusty-yellow, and the middle, broad, dark band is suffused below the costa with a decided brick-red, and the notch runs into and touches the discal dot, being as well marked as in Guenée's figure.

Though I did not see the types of M. Guenée in his collection, his figure and descriptions leave no doubt in my mind as to the correctness of this determination. It was also thus determined by Mr. Sanborn. Walker's type I saw in the British Museum under the name *flammeivirata*.

PETROPHORA MANCIPATA Packard. Plate 8, fig. 45.

Cidaria manicata Guen., Phal., ii, 468, 1857.

Cidaria sabochrysa Pack., Proc. Bost. Soc. N. H., xiii, 409, 1871.

3 ♂ and 4 ♀.—Palpi long, acute. Body and wings dull rusty-brown, with scattered white scales. Head, palpi, and body concolorous. Fore wings dull rusty-brown, a darker band across the base: the outer edge zigzag, consisting of three acute points: that in the median space the largest, very acute; beyond is a paler rusty-brown band, which is succeeded by a little wider dusky band, becoming narrower on the inner edge: a lighter median band enclosing the oval discal dot; this band varies in being brown or white, and is, in the female, twice as wide as in the male, and varies in width in the latter; this median dark or white region is scalloped externally with a large, toothed, subacute projection in the middle of the wing, being straight on the costa and on the inner edge: in some specimens, this outer edge of the median band is clearly resolved into two, and in the single female three, brown, parallel, contiguous, wavy lines: the outer edge of the wing is clear rusty-brown, with a row of obscure dusky patches half-way between the scalloped line and the outer edge of the wing: a submarginal row of longitudinal, intervenular, black, linear spots: a black line at the base of the fringe, and a dusky line along the fringe. Hind wings dusky-ochreous, brighter on the outer third of the wing: a slight discal dot: a brown interrupted line

along the base of fringe, which is dusky-brown. Beneath, bright-ochreous on both wings: a broad dusky band, angulated in the middle of the wing, in the female consisting of two brown lines; this band disappears toward the inner edge. On hind wings, an outer, much-curved, brown line. Brown discal dots present on both wings.

Length of body, ♂, 0.45; of fore wing, ♂, 0.50–0.58; expanse of wings, 1.05 inches.

California (Edwards): Mendocino City; Sanzalito, Cal., May 6–20, June 18, July 16 (Behrens).

This species varies much in the central part of the wing, the band enclosing the discal dot varying from brown to white, and the angle of the outer edge being acute or rounded. It differs from all the other species known to me by the bright ochreous under side of both wings, and the dusky band bent at nearly right angles. Two specimens from Mendocino City are larger, with the inner brown bands more zigzag, and a distinct line on the upper side of the secondaries.

PETROPHORA CUNIGERATA Packard. Plate 8, fig. 43.

Cidaria cunigerata Walk., List Lep. Het. Br. Mus., xxvi, 4726, 1862.

Cidaria disjunctaria Pack., Fifth Rep. Peab. Acad. Sc., 53, 1873.

2 ♂ and 3 ♀.—Fore wings inclined to be rather square at the apex, much as in *P. hersiliata*. Head and palpi as in *P. truncata*, the latter long; third joint long and acute. Body and wings pale ash-gray, rather whiter than usual. Head and palpi with white and dark scales; palpi dark on the tips. Fore wings with four waved and scalloped lines; base of wing dark, two basal lines parallel, the inner one situated half-way between the insertion of the wing and the second line; it sends out a broad, truncated, prominent tooth in the discal space, thence goes straight to the costa; on the internal vein, it is slightly pointed inward; the second line has a large full curve outward in the discal space, with two scallops in the submedian space; a broad whitish band, of the same width throughout, containing two slight, broken, diffuse, dark lines; the third line forms the inner edge of a dark, broad, sub-central band; the line is curved outward in the anterior half of the wing, going straight to the costa from the median vein; it is bent inward on the costa; opposite the distinct discal dot, it sends outward a white, sharp, long point; on the median vein, it is scalloped outward, and twice inward in the

submedian space; the fourth line, forming the outer edge of the band, runs straight (though a little obliquely) from the costa to the middle of the second median space, and from thence it follows a generally oblique course, and ends rather near the internal angle of the wing; above the bend in the line, the scallops are flattened, slightly marked; two slight, re-entering, whitish lines cut into the band just below the costa; below the second median space the line curves in much less than usual, the line not being angulated; the scallops in the first and second median spaces are alike, and the two largest in the line; the one behind the third median venule is smaller than the one behind it; within the band, the two lines form ringlets, as usual, below the median vein; a submarginal, white, zigzag, scalloped line, there being two distinct acute triangles just below the costa, and below isolated white scallops opposite the corresponding scallops, those in the second median and submedian spaces forming distinct lunules; a dark, zigzag, black, oblique line, succeeded by a dark cloud; a marginal black line, slightly interrupted by the venules; fringe whitish, checked with dusky scales. Hind wings whitish, more so than usual; a little dusky on the margin, limited within by a faint-white zigzag line, within which is a dark, distinct, zigzag line, the angles being sharp; beneath whitish, sprinkled with fine brown scales; the four discal dots distinct on the fore wings; an extradiscal is reproduced, and beyond is a row of dark spots, succeeded still beyond by white scallops; a faint sub-apical cloud. Anterior pair of legs dark, ringed with white; middle and hind pair whitish. Abdomen rather stouter than in *P. truncata*, the end being square, and terminating in a mucronate point; pale ash, with a pair of large black spots on each segment.

Length of body, ♂, 0.52, ♀, 0.45; of fore wings, ♂, 0.57–0.72, ♀, 0.63; expanse of wings, 1.15–1.53 inches.

Lake Superior (Harris Coll. Bost. Soc. Nat. Hist.); White Mountains, New Hampshire, August 20–30 (Scudder, Shurtleff Mus. Bost. Soc. Nat. Hist.); Brunswick, Me. (Packard); Albany, N. Y., July 25 (Linnaer); "Nova Scotia" (Walker).

This species differs from *P. truncata* in the apex being less produced; in the white intradiscal band; in the angle of the outer edge of the median band being much less produced; while the band is much darker, the hind wings are also much paler, and the end of the abdomen squarer. From *P. prunata*, to which it is also quite closely allied, it differs in the whiter

ground-color of the wings, and in the outer edge of the middle band being straight from the costa to the median vein; while, in *P. prunata*, it is deeply curved in. It varies in the width of the bands, especially the dark median band, the scallops of which are sometimes deeply cut in, and in the submedian space forming an elongate, oval, black spot, separated from the rest of the band, whence the name *disjunctaria*, under which it was first described. The apical oblique line, and dark cloud beneath, and adjoining white zigzag line, are much as in *P. prunata*. It is, in New England, much less common than *P. truncata*, and perhaps more so than *P. prunata*, which seems to be a more boreal and subalpine species. Whether it may not prove identical with some European species is a question. It seems to be allied to the European *P. miata* (Linn.), which, according to Standinger's Catalogue, inhabits Central and Northern Europe, Piedmont, Southern and Western Turkey, and the Ural Mountains.

This agrees well with Walker's description and a drawing of his type received from Mr. Willis.

A *Cidaria disjunctaria* has been described by La Harpe (Contributions à la Faune de la Sicile, Lausanne, 1860).

PETROPHORA PRUNATA Packard. Plate 8, fig. 47; vars., figs. 46 and 48.

- Geometra prunata* Linn., Syst. Nat., x, 526, 1758.
 "Hübner, Eur. Schm., tab. 59, fig. 304, 1796."
Eustronia prunata Hübner, Verz., 335, 1818.
Cidaria prunata Treits., Schm. Eur., vi, (ii), 194, 1828.
Steganophia prunata Steph., Nomencl. Br. Ins., 44, 1829.
Cidaria prunata Dup., Lep. France, viii (v), 317, pl. 193, fig. 1, 1830.
Steganophia prunata Steph., Ill., iii, 232, 1831.
Cidaria ribesaria Boisd., Gen. Ind., 214, 1840.
Cidaria prunata Boisd., Gen. Ind., 214, 1840.
Laurentia ribesaria H.-Sch., Schm. Eur., iii, 169, 1847.
Steganophia prunata Steph., Cat. Br. Lep., 192, 1850.
Cidaria prunata Guen., Phal., ii, 472, 1857.
Lygris destituta Moeschl., Wien. Ent. Monats., iv, 46, pl. 10, fig. 2, 1860.
Lygris lugubrata Moeschl., Wien. Ent. Monats., vi, pl. 1, fig. 7, 1862.
Cidaria prunata Walk., List Lep. Br. Mus., xxv, 1383, 1862.
Cidaria nubilata Pack., Proc. Bost. Soc. N. H., xiii, 100, 1871.
Cidaria triangulata Pack., Fifth Rep. Peab. Acad. Sci., 54, 1873.
Cidaria montanata Pack., Fifth Rep. Peab. Acad. Sci., 55, 1873.

5 ♂ and 5 ♀.—Of rather large size, and of a peculiar deep russet-brown, with a rusty tinge; a submarginal row of white lunate triangles, ocellated with brown dots. Palpi large, stout, bushy; tip not acute, russet-brown. Front and thorax brown. Fore wings russet, with a rusty tinge; base brownish-

russet; beyond, a broad, pale, zigzag band, with luteous scales on the veins, especially on the costa, and on the internal vein the band is broadly indented on the inner side in the median space; beyond, a broad, russet, dark brown band of unusual width, blackish on each side, its inner edge sinuate, dentate, its outer with three large, mesial, triangular teeth, thence going nearly straight to the costa, with a broad, abruptly acute mesial tooth; a dark, indistinct, discal dot; on the costa are luteous scales, as also a diffuse luteous area below the first median vein, with dark ringlets; a submarginal row of acutely triangular white spots enclosing linear, lunate, brown spots, which become acutely triangular toward the costa; from the third spot from the costa proceeds a once-angulated line to the apex, below which the margin is unusually dark; fringe with ochreous scales externally, and two rows of dark, acutely zigzag lines, bordered externally with white; fringe dark-brown; beneath, the discal dots very distinct; costa ochreous; an outer dark line, which becomes obsolete toward the inner edge; an apical dark patch. Hind wings dusted thickly with brown scales; veinlets ochreous; fringe dusky, spotted with brown, and a brown spot on the inner edge between the end of the fringe and line.

Length of body, 0.44; of fore wing, 0.60–0.70; expanse of wings, 1.30–1.50 inches.

Labrador (Packard); summit of Mount Washington, New Hampshire, August 6 (Sanborn, Scudder, Morrison); Grand Gulf, Mount Washington, New Hampshire, August 25 (Shurtleff); Mount Madison, New Hampshire, September 1 (Scudder).

Var. *nubilata* Pack.—Mountains of Colorado, July 19, September 8 (Lieutenant Carpenter); Denver City, Col., June 1 (T. L. Mead); Colorado (Ridings); American Fork Cañon, Utah, about 8,000 feet elevation, among firs on sides of a mountain, July 22 (Packard, Hayden's U. S. Survey); California (H. Edwards); California, October 21 (Mead); San Francisco, Cal. (Crotch, Mus. Comp. Zool.); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.).

The unusual brown specks beneath on the hind wings, and brown spots on the inner angle of the hind wings, and the brown, ochreous, rusty wings, besides the row of triangles of white, enclosing lunules and triangles of brown, will readily distinguish it. It does not differ from European specimens.

As *nubilata* may by some be regarded as a good species, I append my original description.

"Var. *nubilata*.—(Plate 8, fig. 46.)—3 ♂ and 3 ♀.—Palpi long, acute, dark, with a few pale scales on the edges; front dark in the middle, whitish on the sides. Body and wings ash; base of fore wing dark, limited externally by a white, scalloped line, which is straight on the costa, with a scallop on the median space, another on the submedian, and a third on the inner edge. Another similar line, exactly parallel to this, crosses the wing nearly midway between it and the discal spot, which is small, black, linear-ovate, the interspace filled loosely with scales. Beyond this spot the wing grows more and more dusky to the outer line, which is white and straight, widest on the costa, wrinkled slightly below and in the middle of the wing, between the independent venule and the third median, forming a large, rounded, double-toothed projection; from the third median to the inner edge the line is straight, consisting of three scallops, the central one being largest. A submarginal scalloped line, zigzag toward the costa, each scallop separate, and centered with a triangular or lunate spot. Just below the apex is a black patch, resting on the black line on the edge of the wing. Hind wings whitish, with a few short, dark and white lines on the inner edge; one sinuate, extending to the middle of the wing; just beyond is a line of dusky spots, edged broadly with white externally; the outer edge of the wing is dusky, with a black, marginal line, interrupted by white dots. Beneath, both wings much alike, ashy, with a slight ochreous tinge, blackish along the edge of the costa; discal dot distinct on the fore wings. A dusky outer line half-way between the discal dot and outer edge of the wing, indented opposite the discal dot. A submarginal row of distinct white spots, less distinct on the hind wings. A long pencil of black hairs arises from the base of the fore wings, and is partially concealed by the costa of the hind wings. Legs dusky, broadly ringed with white.

"Length of body, ♀, 0.45–0.50; of fore wing, ♂, 0.64–0.75 inch (Edwards)."

Though my Labrador specimen differs somewhat from Moeschler's description and figure, yet I am inclined to unite it with *P. prunata* var. *lugubrata*. I have before me a specimen from Mount Marey, New York (August), (figured on plate 8, fig. 48), and from Mount Washington, New Hampshire (Sanborn), and numerous specimens from California and Vancouver Island.

The extremes are presented by the Labrador and Vancouver Island examples. The Pacific-coast forms are larger, blacker, the fore wings more elongated toward the apex than the eastern specimens, much as observed in *Scythothusa disjuncta* (Walk.), in which the Labrador individuals are stunted, while the west-coast (Vancouver Island) specimens are larger. They are paler, however, than the Labrador and New England individuals. The Colorado *P. prunata* var. *lugubrata* scarcely differs from the Californian and Vancouver Island ones. My Labrador individual (well preserved) has already been described. The Adirondack (Mount Marcy) one is very similar, but differs in being of a peculiar reddish-brown tint, especially along the costa and veins. The outer line between the costa and median vein is angulated outward, instead of curved regularly outward, as in the Labrador example. The Adirondack is very near the Labrador one, though a little browner along the veins. In the Colorado and Pacific specimens, the outer line near the costa is scalloped four or five times. The middle band of the fore wings is much darker than the rest of the wing; the inner and outer portions being much paler than in the eastern examples. Expanse of wings of Colorado and Vancouver Island specimens, 1.43 inches; of Labrador and alpine, Eastern United States, 1.25 inches.

In the general style of markings, this species closely resembles *C. populata*, as remarked by Moeschler. I do not much doubt but that both have come from a common stock; *lugubrata* being perhaps originally derived from a melanotic variety of *populata*.

There are, then, four forms, or varieties, of *prunata*, viz: the normal *prunata* (fig. 47); and the vars. *destinata* (very near *prunata*), *lugubrata* (fig. 48), and *nubilata* (fig. 46).

Standinger gives the following localities of the form *prunata*: Central and Northern Europe, excluding (?) the polar regions; Central and Northern Italy; Dalmatia; Ural Mountains; Altai Mountains; Northern and Eastern Siberia.

PETROPHORA LEONINATA Packard. Plate 8, fig. 44.

Cidaria leoninata Pack., Proc. Bost. Soc. N. H., xiii, 491, 1871; xvi, pl. 1, fig. 43, 1874.

1 ♂ and 3 ♀—This is a very small species, with long, acute palpi, and male antennæ ciliated as usual. The body and wings are tawny-brown, with scattered patches of ochreous scales. Palpi tawny, with scattered white scales. Front ochreous, with brown scales. Fore wings with three broad,

dusky bands, of nearly equal width, angulated on the median space, and scalloped on the edges, which are black; those of the second and third bordered with white. The second and third, with the band between, form a central, dusky band, occupying the middle third of the wing, and containing an indistinct, brown, discal dot; the outer edge of the band is less angulated than in the two preceding species, and consists of three large scallops, being straight on the costal and subcostal region. A submarginal row of brown patches, margined externally with white points; toward the apex are three longitudinal black streaks, with an oblique, black, apical streak, interrupted by the venules. A row of marginal black dots. Fringe brown, pale at base, and checkered with dusky spots. Hind wings tawny, rather dusky on inner two-thirds, with the usual marginal row of fine, black dots. Beneath, ochreous dusky on the inner two-thirds of wings; the outer edge of the dusky area indented on the independent vein, and going from the second median obliquely inward. Two minute, black patches on the costa; near the apex an apical black spot. Fringe checkered with dusky spots.

Length of body, ♂, 0.40; of fore wing, ♀, 0.41; expanse of wings, 0.95 inch.

California (Edwards); Mendocino City (A. Agassiz, Mus. Comp. Zool).

Two specimens from Mendocino City (received from Mr. Behrens) are larger than usual, with the inner brown band more zigzag, and a distinct line on the upper side of the hind wings.

This diminutive species seems more nearly allied in its style of markings to *P. prunata* than any other. We have nothing like it east of the Rocky Mountains.

PETROPHORA ALBOLINEATA Packard. Plate 8, fig. 50.

Cidaria albolineata Pack., Fifth Rep. Peab. Acad. Sc., 55, 1873.

2 ♂ and 1 ♀.—Front pale luteous; palpi pale above and at tip, blackish on the sides; head beneath luteous. Fore wings black, with a subbasal, broad, whitish band, angulated on the median vein, and with smaller, very acutely-produced angles on the veins; on each side, in the middle, the sides formed of white lines, are intervenular dark patches; a broad, mesial, black band, narrowing toward the inner edge, lined externally with white; discal dot very black; from the first median interspace to the costa the outer line goes straight, with a slight sinus on the costa; below, it consists of three

intervenular rounded lobes, that, in the middle of the wing, are larger; beyond, on a luteous or pale-ochreous ground, is a row of acutely triangular, black spots, the one below the second median venule being acutely elongated lunate; a zigzag white line goes to the costa, marking a marginal, subapical, black, triangular space; fringe long and blackish, interrupted with white. Hind wings pale cinereous, a little dusky on basal two-thirds; discal dot distinct; beneath, margin of wings paler, marked off by a quite distinct dark line; near the apex on costa three narrow, black, parallel, longitudinal spots. Legs dusky cinereous, ringed with whitish.

Length of body, 0.35; of fore wing, 0.45; expanse of wing, 1.00 inch.

Quebec, Canada (F. X. Bélanger); Brunswick, Me. (Packard); White Mountains, August 23 (Shurtleff); New Hampshire (Fronvelet, Bost. Soc. Nat. Hist.); Sharon, N. Y., July 24 (Lintner).

Very distinct, and easily known by the black middle of the wing lined with white, and by the black triangular patch just below the apex on the outer margin, while the margin of the wing is luteous, interrupted with acutely triangular black spots, and the head, tip, and upper side of palpi are also luteous.

PETROPHORA ATROCOLORATA Packard. Plate 8, fig. 19.

Cidaria atrocolorata Grote and Rob., Ann. Lycæum N. Y., viii, 39, pl. 16, fig. 11, ♀, April, 1867.

2 ♂.—This fine species belongs near *P. albolineata*, but is much larger, though in the form of the head, palpi, antennæ, and wings it is nearly the same. The ground-color of the body and wings is blackish-brown. Head yellowish-white on the vertex and at the tips of the palpi. Thorax with three linear, whitish stripes. Abdomen ringed with white, and the anal tuft tawny-white. Fore wings blackish-brown, with an inner line directed obliquely outward and bent at right angles on the internal vein, where it touches the second double line, which is parallel to the basal as far as the bend in the latter, thus inclosing a large, square, black patch, one side of which rests on the costa, while there is a triangular dark spot on the inner edge of the wing; the middle of the wing is occupied by a large square patch connecting with a round patch on the inner edge, this round spot being nearly cut off from the black patch by the points projecting from the two opposite lines; the outer (extradiscal) line forms a nearly rectangular

point in the middle of the wing, below which is a rounded point; the line is shaded externally with tawny-yellow, beyond which is a row of dark lunules edged externally with white; these lunules are most distinct behind the large point in the middle of the wing; from the costa, half-way between the apex and the outer line, a white line, broken up by the whitish-yellow venules, connects with the long, narrow, oblique, apical line; a yellowish, narrow, marginal line, separated by a narrower, dark line from the tawny, slightly-checkered fringe. Hind wings dull chocolate-brown, with a deeply-sinuuous, median, pale line, and a submarginal scalloped line; fringe as on anterior wings; beneath, richly tinted on both wings with brown and tawny scales; discal dots very distinct; a dark extradiscal line common to both wings, well bent in the middle; half-way between this line and the edge of the wing a row of white, triangular spots. Fringe distinctly checkered.

Length of body, ♂, 0.60; of fore wing, ♂, 0.70; expanse of wings, ♂ 1.43 inches.

Brooklyn, N. Y. (Graef); Philadelphia, Pa. (Grote and Robinson); Easton, Pa. (Stultz).

This description has been drawn up from the type-specimen kindly loaned by Mr. Grote. It is very characteristic, and need not be confounded with any other of the species.

PETROPHORA TESTATA Packard. Plate 8, fig. 51.

"*Phalana-Geometra testata* Linn., Fauna Svecica, 331, 1761."

Phalana testata Fabr., Ent. Syst., iii (ii), 202, 1793.

"*Geometra achatinata* Hübner., Schm. Eur., tab. 58, figs. 301, 408 *ab*, 1796."

Lygria achatinata Hübner., Verz., 335, 1818.

Cidaria achatinata Treits., Schm. Eur., vi (ii), 170, 1828.

Dup., Lep. France, viii (v), 311, pl. 192, fig. 6, 1830.

Electra testata Steph., Ill., iii, 240, 1830.

Electra achatinata Steph., Ill., iii, 241, 1831.

Cidaria achatinaria Boisd., Gen. et Ind., 213, 1840.

Larentia achatinaria H. Sch., Schm. Eur., iii, 172, figs. 301, 408, 1847.

Electra achatinata Steph., Cat. Lep. Br. Mus., 190, 1859.

Cidaria testata Guen., Phal., ii, 473, 1857.

Lygria testata Staud., Cat., 78, 1861.

Cidaria testata Walk., List Lep. Brit. Br. Mus., xxv, 13-4, 1862.

2 ♂ and 2 ♀.—Closely allied structurally and in color to *P. diversilineata*; lemon-yellow; abdomen and hind wings whitish. Head slightly paler above than the palpi. Fore wings lemon-yellow, with two parallel, reddish-ochreous lines near the base, each making an obtuse angle in the discal space; beyond, an ochreous line, curved outward around from a little within the middle of the

costa to the middle of the inner edge, with a small tooth pointing inward just above the internal vein; outer line running straight from the outer quarter of the costa in an oblique direction to the first median vein; scalloped slightly in the two succeeding interspaces; in the submedian interspace the line is straight, directed a little outward; the region between these two lines a little darker ochreous than the rest of the wing, with two faint, parallel, median hair-lines passing through it; beyond, and especially toward the apex, the wing is lemon-yellow, frosted with white; the apical, oblique streak white, a little waved below; under the line deep-ochreous; fringe whitish. Hind wings whitish, with a faint outer line; in the male, tinted faintly with pale-brown along the outer edge of the wing; beneath uniformly whitish, with two brown hair-lines common to both wings, the inner obsolete away from the costa, and a little scalloped on the hind wing; discal dots dark, distinct beneath on both wings.

Length of body, ♂, 0.60, ♀, 0.43; of fore wing, ♂, 0.64, ♀, 0.58; expanse of wings, 1.20 inches.

Newton, Mass. (Dr. Waters); Brookline, Mass., August 26 (Shurtleff, Bost. Soc. Nat. Hist.); New Jersey (H. Sachs); Easton, Pa. (Stultz); Bailey's Ranch, on South Park Road, twenty-five miles from the park, elevation 8,000 or 8,500 feet, Colorado Territory. August 29 (Mead); Victoria, Vancouver Island July, (G. R. Crotch, Mus. Comp. Zool.).

This species is characterized by the frosted appearance of the wings, the lines being edged with white; by the third line on fore wings being regularly curved outward, and not pointed and scalloped. The outer line is less scalloped below the first median venule than usual, and the triangular, deep ochreous, apical spot is very distinct. It is identical with the European *P. testata*, as I find by comparing our specimen with two from Europe received from Dr. Staudinger. The hind wings are apt to be darker, more yellowish, in American examples.

Staudinger gives the following distribution: Central and Northern Europe, excluding Galicia and (?) Hungary; Ural Mountains; Altai Mountains; Amur.

Larva.—"The caterpillar, when full-grown, rests in a straight posture, and does not fall off its food-plant when disturbed; the head is flat and prorected; the body is cylindrical, without humps. The head is putty-colored, with darker dots and reticulations; the body, also, is putty-colored; the back

has a slender, median, brown stripe; the sides have two dingy-white stripes, the upper straight, the lower undulating: the spiracles are placed below the second white stripe, and are intensely black; the belly has six whitish stripes, of which the median ones are closely approximate. The divisions of the segments are marked by slender rings of a pink tinge. It feeds on birch and willow, and is full-fed at the end of May, when it spins a few threads, and draws together the leaves of its food-plant, making a very open kind of network cocoon, so open, indeed, as not in any degree to hide the enclosed chrysalis, which will even drop out through the meshes if shaken. The chrysalis is rather long, and very pointed at the tail; it is of pale putty-color, with a broad, conspicuous, median, brown stripe down the thorax and body; the oblique posterior margins of the thorax are also of the same dark color; the head and wing-cases are dingy-brown, lined with darker brown, by which color the antennæ, legs, wing-rays, &c., are clearly indicated; the antennæ case slightly exceeds that of the wings in length. On the body is a median dark stripe below, corresponding with that above, and the lateral region between these two stripes is spotted with dark-brown."—Newman's British Moths, 191.

PETROPHORA POPULATA Packard. Plate 8, fig. 52.

Phalana-Geometra populata Linn., Syst. Nat., x, 525, 1758.

Phalana populata Fabr., Ent. Syst., iii (ii), 176, 1793.

"*Geometra populata* Hübner, Schm. Eur., tab. 58, fig. 300 (male), 1796."

Eggris populata Hübner, Verz., 235, 1818.

Cidaria populata Treits., Schm. Eur., vi (ii), 165, 1828.

Electra populata Steph., Nomencl. Br. Ins., 44, 1829.

Calaria populata Dup., Lep. France, viii (v), 305, pl. 192, fig. 2, 1830.

Electra populata Steph., Ill., iii, 239, 1831.

Cidaria popularia Boisd., Gen. Ind., 213, 1840.

Laroceta popularia H.-Sch., Schm. Eur., iii, 172, 1847.

Electra populata Steph., Cat. Br. Lep., 189, 1850.

Cidaria populata Guen., Phal., ii, 173, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1385, 1862.

3 ♂ and 4 ♀.—Straw-yellow; palpi with darker scales; third joint much paler, large, and prominent. Front of the head yellow, darker toward the front edge. Antennæ yellow; in the male minutely ciliated; body uniformly yellow. Fore wings with a broad, zigzag, basal stripe, and a broad, very distinct band, occupying a third of the wing, and an apical stripe. The broad basal band is pointed acutely on each vein, with a much larger, very prominent angle in the median space; this band is composed of three dark

lines, with yellow between, the mesial band being curved with two strong angles below the median vein, the outer two rounded and very large, much more prominent than in *P. testata*, shaded diffusely within. In the middle of the band is an angular, curved row of large, yellow, round spots; the outer edge of the band is supplemented by a dusky ochreous, narrow line. The submarginal row of tawny triangles lined with white, present in European examples, is usually wanting. The rest of the wing clear, with a dark, oblique, apical patch, shading below into a dark ochreous hue. Base of fringe with a dark line. Hind wings pale yellow, with a subterminal, irregular, dark line, becoming obsolete toward the costa. Beneath, the discal dots are conspicuous, and there is a straight, dark, narrow line on the outer third of the wing, all that re-appears of the outer double band above. On the hind wings is a faint, extradiscal, curved, dentate line.

Length of body, 0.55; of fore wing, 0.75; expanse of wings, 1.30–1.40 inches.

Labrador (Moeschler); Brunswick, Me. (Packard); Brooklyn, Mass. (Shurtleff); Beverly, Mass. (Burgess); White Mountains, New Hampshire, August (Sanborn, Bost. Soc. Nat. Hist.); Tuckerman's Ravine, Mount Washington, New Hampshire, August 25 (Shurtleff, Bost. Soc. Nat. Hist.); Mount Ascutney, Vermont (Sanborn, Bost. Soc. Nat. Hist.); near Berthoud's Pass, Colorado, 12,000 to 13,000 feet elevation, August 16 (T. L. Mead); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.).

This pretty species is easily known by its large size, the dark-brown double lines and bands, the dark apical patch, and the two large teeth on the outer side of the middle double band.

On comparing several American examples with three from Germany, received from Professor Zeller, I do not find any specific difference. Our specimens mostly (except the Colorado individual) want the submarginal row of triangular, tawny spots on the fore wings, which are very distinct in the European examples; but, in one rubbed American specimen, there is an approach to this in a series of obsolete spots.

The distribution in the Old World, according to Standinger, is as follows: Central and Northern Europe; Ural and Altai Mountains; Amur.

Larva.—The caterpillar has the head rather small; the second segment also rather small; the third segment is swollen, or furnished with a dorsal band, raised transversely. In color, it is remarkably variable, being of one

or two tints of green, pale brown, reddish brown, or even dark brown; the raised band is dotted with white on a black or reddish ground, according as the ground-color of the caterpillar is dark or light. There is a medio-dorsal stripe of a reddish tint, and an olive-green stripe in the region of the spiracles. It feeds on the whortleberry (*Vaccinium vitis-idaea*), and in confinement it will thrive on sawfly. For these few particulars we are indebted to Mr. Hellins."—Newman's British Moths, 191.

PETROPHORA DIVERSILINEATA Hübner. Plate 8, figs. 53, 54.

Petrophora diversilineata Hübner, Samml. Exot. Schm., i, 1, 2, 3, 4, 1806.

Euphyia diversilineata Hübner, Verz., 336, 1818.

Cidaria diversilineata Guen., !!!, Phal., ii, 475, 1857.

Walk., !!!, Lep. Br. Mus., xxv, 1389, 1862.

Cidaria gracilineata Guen., Phal., ii, 476, 1857.

30 ♂ and 10 ♀.—Palpi long. Fore wings falcate; outer edge almost angular. Hind wings slightly scalloped. Body and wings of a uniform ochreous-yellow; palpi dark in front of the head, tipped with dark-brown. Fore wings uniformly ochreous; a curved, basal, rust-brown line, denticulated on the veins; beyond, two parallel, more distinct, concolorous lines, the inner a little wavy, directed obliquely to the inner edge; the outer makes a right angle in the submedian space, crosses the inner line, forming a broad, triangular enclosure on the inner edge of the wing; beyond is a broad space, just beyond the middle of the wing, usually filled in with a purplish-brown tint, disappearing before reaching the costal space; sometimes there are two central lines in this space, converging a little below the median vein and forming large ringlets; this mesial space is bounded externally by a dark, rust-brown line, which ends at the same distance from the base of the wing both on the costa and inner edge; in the first median space it forms a large, sharp projection; beyond is another concolorous line, which curves inward to where it is usually (not always) interrupted by the projection of the other line, and thence goes straight, though zigzag in its course, to the inner edge of the wing; a similarly-colored, more or less zigzag, oblique, apical line extends to the middle of the wing, opposite the projection; the edge beyond the lines either clear-yellow or filled in with lilac-brown; a small discal dot. Hind wings clear, a little paler than the fore wings, with a faint discal dot, sometimes absent; in the outer third of the wing an angulated, faint, violet-brown line, edged externally with silver, a heavier,

diffuse, shorter, submarginal, dark-brown, zigzag line, with a slight violet tinge; the space between this and the wing suffused with violet-brown, extending only toward the middle of the wing, or sometimes passing beyond toward the apex. Beneath, the wings are yellow ochreous, speckled, especially on the hind pair, with coarse, violet-brown specks. Fore wings clear when covering the hind ones, with three costal spots, the third in the middle of the costa; beyond, the angulated outer line is reproduced; apical, oblique line distinct, with a violet-brown cloud below. Hind wings with three regularly-scalloped lines; the margin of the wing broadly clouded with violet-brown. Legs yellow; joints tipped with violet-brown. Abdomen yellow, tinged above with rust-brown.

Length of body, ♂, 0.60, ♀, 0.50-0.61; of fore wing, ♂, 0.58-0.61, ♀, 0.65-0.70; expanse of wings, ♂, 1.30-2.10, ♀, 1.35 inches.

Brunswick, Me., July (Packard); Portland, Me. (E. S. Morse); Cambridge, Mass. (Harris Coll.); Andover, Mass. (Sanborn, Mus. Bost. Soc. Nat. Hist.); Brookline, Mass., August 17 (Shurtleff, Mus. Bost. Soc. Nat. Hist.); Salem, Mass., August and early in September (Packard); Nahant, Mass. (Moering); Albany, N. Y., July 3 (Lintner); Oneida, N. Y. (R. V. Hawley); New York (Morison); Brooklyn, N. Y. (Graef); West Farms, N. Y. (Angus); New Jersey (H. Sachs); Philadelphia, Pa. (Amer. Ent. Soc.); Easton, Pa. (Stultz); Texas, May 14 (Bellrage); Detroit, Mich. (Swartz, Mus. Comp. Zool.); "Amer. Sep." (Guenée); "New York; Illinois; Massachusetts; Orilla, Western Canada" (Walker).

This is a common and widely-diffused species, ranging from Southern Maine to Texas, but has not yet occurred west of the Mississippi River. It flies during July and August, entering houses and settling on the walls, resting with its abdomen curved grotesquely over its back. It varies much in size and considerably in its markings, especially in the extent of the violet-brown markings; the middle of the wing is, however, often clear, and, when so, the two inner lines appear, forming large ringlets below the median vein. The margin of both wings is sometimes clear ochreous-yellow, except on the internal angle of the hind wings. The distance between the lines varies considerably; but the species is very distinct from any other of the genus, and may at once be recognized by the dark, clear lines, the extradiscal one forming a large, conspicuous, falcate angle in the middle of the wing; also,

by the oblong space on the inner third of the wing, succeeded by a triangular enclosure on the inner edge of the wing.

The largest specimen comes from Philadelphia. It differs from all the other specimens which I have carefully examined in the triangular space being merged in with the oblong space, the converging lines being separated by a considerable space.

It is possible that there are two broods in Texas.

I am inclined to regard this Philadelphian specimen, and others with the intra- and extradiscal lines farther apart than usual, as Guenée's *Cidaria gracilineata* (see my plate 8, fig. 54). His description agrees well with these specimens. There are, however, others connecting the two forms, so that *gracilineata* may denote a race or strain, but scarcely a variety.

Larva.—I have found the caterpillars varying from green to brown; and, while *diversilineata* feeds on the grape-vine and *Ampelopsis*, the *gracilineata* is said by Guenée to feed on a *Vaccinium*, on which *diversilineata* may yet occur. Mr. W. Saunders, of London, Canada, has found the larva feeding on the woodbine. According to his notes, "the body above is dark-brown, with a slightly-reddish tint, and patches of a darker shade along the dorsal region, being the color of the twigs of its food-plant. It remains in the pupa state about a week." I have found both brown and green specimens feeding on the leaves of the grape-vine in midsummer. The larva is long and very slender, smooth, cylindrical, and in its general shape agrees with the diagnosis of the genus given by M. Guenée. I regret that I did not draw up a detailed description of the larva.

Pupa.—The following description is taken from a well-preserved cast skin in the Harris Collection: Body rather stout; wing-covers reaching to the seventh abdominal ring, counting from the end; the tip is acutely conical; anal spine large, acute, much flattened from above downward; bearing two large, curved spines, with two much smaller, curved, basal spines; abdomen with scattered, acute spinules arising from minute, black tubercles; pale ash, minutely speckled with darker fine points, with a dark dorsal line extending from the head to the end of the anal spine. Length, 0.55 inch.

Egg.—Cylindrical, much rounded and fuller at the posterior than at the anterior end, which is truncated and contracted, with a swollen rim; white, with the surface granulated.

PETROPHORA FLAVATA Packard. Plate 8, fig. 55.

Euklousa flavata Pack., Proc. Bost. Soc. N. H., XVI, 35, 1874.

1 ♂ and 2 ♀.—Body and wings deep ochreous yellow. Palpi brown on the sides of the second joint. Fore wings clear yellow; costa fawn-brown at base; two costal brown spots in the middle of the wing, the inner oblique, the outer nearly straight; no lines in the middle area of the wing; a small discal dot (sometimes wanting); a minute dot on the origin of the third or lower median venule; outer edge of the wing below the apex broadly margined with fawn-brown to, and enclosing, the anal angle, the band being as broad as the thorax. Hind wings concolorous with the fore wings; a rather large dark dot close to the origin of the first subcostal venule; a triangular marginal patch just below the apex; otherwise no markings; beneath, from a large, basal, costal spot proceeds a fine curved line across the wing, and, with a much-curved one within, forms a ringlet; beyond the conspicuous, dark, discal dot, a broad, diffuse, pale-brown shade crosses the wing, slightly scalloped externally; the shade does not connect with the outer costal spot; the marginal shade is dark on the oblique upper edge, but is fainter toward the anal angle than on the upper side of the wing; a faint row of diffuse small spots between this shade and the middle shade. Hind wings with a very distinct discal dot; a narrow, fine, much-curved line crosses the middle of the wing; another sinuate line midway between this and the margin; the part just below the apex is oblong rather than triangular, as above. Fringe brown on both wings, with darker spots on the ends of the venules beneath; toward the anal angle of the secondaries the fringe becomes yellowish. The two females and one male are paler, without the marginal dark band, while the lines below are well marked, the male median shade of the primaries being represented by a very distinct sinuate line, with three rude ringlets on the inside of the line, and the fringe is yellowish. In another specimen, the lines are much more distinct.

Length of body, ♂, 0.45, ♀, 0.40; of fore wing, ♂, 0.50, ♀, 0.50; expanse of wings, 1.10 inches.

Sierra Nevada (Edwards).

This interesting species may be known by the non-angulated yellow wings, with the broad marginal shade, the subtriangular spot on the hind wing, and the large discal dots on the hind wing on the inner third of the wing.

So much does it differ from the other species that I was led to regard it as not belonging to the *Larentinae*; but I am indebted to M. Guenée for calling my attention to the fact that it is, to use his own words in a letter to me, “une *Cidaria* voisine de *fulvata*, *pyraliata*, etc.”

Desiderata.

Cidaria suspectata Mäschler, Ent. Zeitung, Stettin, xxv, 160, 1874.— Aus der Verwandtschaft von *Truncata* Hfngl. und *Immanata* Haw., von welchen meine beiden übereinstimmenden Exemplare aber spezifisch verschiedenen scheinen.

Kopf, Thorax und Palpen bräunlichgrau, Hinterleib gelblichweiss, Beine ebenso, die Tarsen graubraun, weisslich geringelt.

Wurzelfeld der Vorderflügel weissgrau, schwärzlich bestäubt und von zwei schwärzlichen, gegen den Vorderrand winklig gebrochenen Querstreifen begrenzt und durchzogen. Hinter denselben folgt ein graugelbes Querband, welches in der Mitte dunkelgrau bestäubt ist, so dass seine Ränder hellen Linien gleichen; unterhalb der hintern Mittelrippe steht ein undeutlich begrenzter, rostrother Fleck. Das Mittelfeld wird durch eine schwarzbraune Querbinde gebildet; dieselbe ist am Vorderrande breit, fast das Drittheil desselben einnehmend, und verschmälert sich über die Hälfte am Innenrande; nach innen zieht sie vom Vorderrande bis auf die vordere Mittelrippe gerade, bildet auf derselben eine kaum merkliche Ecke und biegt sich dann bis zur hintern Mittelrippe etwas ein; von da bis zum Innenrande bildet sie drei Bogen, deren mittlerer etwas wurzelwärts tritt; nach aussen bildet sie zwischen Vorderrand und Rippe 6 zwei Bogen, zieht sich zwischen Rippe 5 und 6 plötzlich ein und tritt auf Rippe 4 in einem Bogen etwas weiter nach aussen; sodann zieht sie sich in zwei Bogen auf Rippe 3 und 2 wieder nach einwärts und tritt von da bis zum Innenrande wieder etwas auswärts. Gegen den Vorderrand zeigt diese Binde weissgraue Bestäubung und beiderseits kurze Anläufe eines schwarzbraunen Querstreifens. Die Rippen sind fein schwarz bestäubt, der Mittelpunkt schwarz. Saumwärts wird die Binde von einem weissgelben Fleck am Vorderrande begrenzt; aus ihm zieht sich eine feine, gleich gefärbte Linie bis zum Innenrande, an welchem sie in einem kleinen Fleck endigt. Der Raum zwischen der Binde und der Wellenlinie ist am Vorderrande schwärzlich und durch den hellen Fleck sehr verschmälert, übrigens rostroth. Die Wellenlinie ist weiss; am Vorderrande steht hinter

ihr ein weissgrauer Schüffelfleck zur Flügelspitze; von ihm bis zur Rippe 4 färbt sich das Saumfeld schwarz, von da bis zum Innenwinkel schwärzlich-braun, weissgrau gemischt. Die Saumlinie ist schwarz, nicht in Fleckchen aufgelöst. Die Franzen sind weissgrau, gegen die Wurzel mit starker, braungrauer Theilungslinie; eine zweite solche, etwas hellere Linie zieht hinter der ersten den Spitzen näher. Beide Linien sind nicht unterbrochen, und es zeigen sich in den Franzen kleine dunkle Fleckchen auf den Rippen.—Hinterflügel schmutzig weissgelb, gegen den Saum etwas dunkler angeflogen; durch die Mitte zieht ein undeutlicher, fast in Flecke aufgelöster, schwärzlicher Querstreif, vor dem Saum ein zweiter ganz verloschener Querstreif. Saumlinie dunkel braungrau. Franzen licht schmutzig gelb, mit dunkel braungrauer Theilungslinie und dergleichen Fleckchen auf den Rippen. Unterseite der Vorderflügel bis zum äussern Rande der Mittelbinde hellgrau, am Vorderrande weissgelb bestäubt; die zwei Bogen der Mittelbinde nächst dem Vorderrande von einem schwarzen Streif saumwärts begrenzt. Von der Mittelbinde bis zum Saum ist der Flügel gelblich. Die Wellenlinie wird durch ein schwärzliches Querband ersetzt; hinter demselben zeigt sich die gelbliche Grundfarbe in der Flügelspitze als ein dreieckiger, nach hinten von einem schwärzlichen Fleckchen begrenzter Fleck; von diesem bis zum Innenwinkel ist die Grundfarbe weissgrau. Saumlinie fein schwarzbraun von den hellen Rippen durchschnitten; Franzen wie oben. Hinterflügel gelblich, Wurzelfeld grau bestäubt; die beiden dunkeln Querstreifen deutlich, Franzen wie oben.

Flügelspannung 34–35 mm. Vorderflügelbreite 8 mm.

2 Weiber aus dem südlichen Labrador, von gleichem Fundort mit *P. frigida* etc. [Lat. 55–55° N.].

Von *Truncata* und *Inmanata* trennt diese Art die sehr verschiedene Gestalt der Mittelbinde.

Larentia cervinifascia Walk., List Lep. Het. Br. Mus., xxiv, 1184, 1862.—♀.—Cinereous. Head, thorax, and fore wings minutely black-speckled. Palpi slender; not extending beyond the head. Wings with minute, black, marginal points, which are nearly connected. Fore wings with a fawn-colored tinge at the base, and with a very broad, fawn-colored, whitish-bordered, middle band, which is dilated on the outer side, and does not extend to the costa; submarginal line whitish, denticulated, traversing a black, irregular,

oblique, apical streak; a small, oblique, ferruginous streak in the band; costa and exterior border slightly convex; the latter very oblique. Hind wings whitish, with a brown discal point and some traces of an exterior brown line.

Length of the body, 5 lines; of the wings, 14 lines.

a, Orilla, West Canada. From Mr. Bush's collection.

This species is figured on plate 10, at the end.

Larentia ziczacata Walk., List Lep. Br. Mus., xxiv, 1185, 1862.—♀.—Cinereous. Head with a blackish mark on the vertex. Palpi mostly blackish, extending very little beyond the head. Tegulae of the thorax marked with black. Fore wings with a black basal point, and with three brownish cinereous bands, which are bounded by denticulated black lines; discal mark deep-black, large, elongated, in the second band; costa and exterior border very slightly convex, the latter very oblique.

Length of the body, 5 lines; of the wings, 14 lines.

a, Saint Martin's Falls, Albany River, Hudson's Bay. Presented by Dr. Barnston.

Cidaria remotata Walk., List Lep. Br. Mus., xxv, 1388, 1862.—♂.—Brown. Palpi stout, hardly pilose; third joint very minute. Antennae stout, slightly moniliform, hardly pubescent. Wings rather broad; fringe cinereous; under side cinereous, with a blackish discal point and two curved, exterior, blackish lines. Fore wings acute, with some transverse, whitish, cinereous streaks, which are broadest on the costa, and are attenuated from thence to the disk, where they cease; submarginal line pale cinereous, undulating acutely angular toward the interior angle; an elongated black spot extending from the tip between the submarginal line and the exterior border, largest on the under side. Hind wings brownish cinereous, with a curved, whitish, cinereous, submarginal line.

Length of the body, 5 lines; of the wings, 14 lines.

a, Saint Martin's Falls, Albany River, Hudson's Bay. Presented by Dr. Barnston.

Cidaria propulsata Walk., List Lep. Br. Mus., xxv, 1389, 1862.—♂ and ♀.—Pale-ochraceous. Palpi prominent, fringed, as long as the breadth of the head; third joint elongate-conical. Antennae of the male stout, pubescent. Fore wings acute, subfalcate, with three darker, ochraceous, angular bands,

which have fawn-colored or brown borders, and are sometimes partly shaded with fawn-color; an elongated, darker, ochraceous patch along the fore part of the exterior border; exterior border slightly convex and oblique. Hind wings whitish, with an ochraceous tinge along the exterior border.

Length of the body, 6-7 lines; of the wings, 16-18 lines.

a-c, Newfoundland. Presented by W. C. St. John, esq.

d, Nova Scotia. From Lieutenant Redman's collection.

e, Orilla, Western Canada. From Mr. Bush's collection.

f-i, New York. Presented by E. Doubleday, esq.

Cidaria rigidota Walk., List Lep. Het. Br. Mus., xxvi, 1727, 1862.—♂.—Cinereous. Palpi short, porrect. Antennae smooth, rather slender. Abdomen not extending behind the hind wings; apical tuft very small. Legs smooth, slender; hind tibiae with four long spurs. Wings elongate. Fore wings acute, mostly tinged with brown, with three black lines; first line, near the base, slightly zigzag; second line, interior, undulating, diffuse on the inner side, where it is accompanied by a slight brown line; third line undulating, dentate, with a black streak between it and the tip of the wing; submarginal line pale cinereous, zigzag; exterior border slightly convex, very oblique. Hind wings paler, with a slight, brownish, undulating, exterior line.

Length of the body, 5 lines; of the wings, 16 lines.

a, Nova Scotia. From Lieutenant Redman's collection.

Cidaria exflagiata Walk., List Lep. Het. Br. Mus., xxvi, 1728, 1862.—♀.—Brownish cinereous. Palpi porrect, obtuse, much shorter than the breadth of the head; third joint extremely minute. Fore wings slightly acute, thinly speckled with black; basal, interior, and exterior lines black; basal space and the space between the interior and exterior lines brownish; a row of elongated black points beyond the exterior line; submarginal line whitish, zigzag; discal streak blackish; exterior border slightly convex, very oblique. Hind wings a little darker about the exterior border; discal mark and exterior zigzag line brownish.

Length of the body, 4 lines; of the wings, 12 lines.

a, Nova Scotia. From Lieutenant Redman's collection.

Larentia fumidotata Walk., List Lep. Het. Br. Mus., xxvi, 1701, 1862.—♂.—Blackish cinereous. Head very pilose in front. Palpi porrect, extending

very little beyond the head; third joint extremely short. Abdomen not extending beyond the hind wings. Legs smooth; hind tibiae with four rather long spurs. Wings moderately broad; marginal lunules blackish; fringe pale cinereous, with dark marks. Fore wings acute, with several pale, cinereous, denticulated lines; costa almost straight; exterior border slightly convex, rather oblique.

Length of the body, 5 lines; of the wings, 17 lines.

a, West Greenland. Presented by M. Boie.

Larentia longipennis Walk., List Lep. Br. Mus., xxxv, 1671, 1866.—♀.—Pale cinereous, minutely brown-speckled. Palpi porrect, not extending beyond the head, blackish on the outer side. Antennae and legs slender. Abdomen not extending beyond the hind wings. Wings long. Fore wings slightly rounded at the tips; a brown, partly black, very deeply bent, middle line, which is partly or completely and broadly bordered with brown on the outer side, and has a short, transverse, black streak near its inner side; a blackish angular line near the base; two brown, zigzag, submarginal lines, which include a whitish band; several other brown lines, which are only apparent near the costa; eight pairs of black marginal points; exterior border convex, very oblique. Hind wings without markings, slightly brownish along the exterior border.

Length of the body, 5 lines; of the wings, 15 lines.

a, *b*, North America. From Mr. Carter's collection.

OCHYRIA Hübner. Plate 1, figs. 8, 8*a*, 8*b*.

Ochyria Hübn., Verz., 334, 1815.

Cidaria Treits. (in part), Schm. Eur., vi (ii), 140, 1828.

Steph. (in part), Nomencl. Br. Ins., 41, 1829.

Eubolia Dup. (in part), Lep. France, viii (v), 162, 1830.

Cidaria Steph. (in part), Bl., iii, 263, 1831.

Eubolia Borsd. (in part), Gen. Ind., 201, 1840.

"*Coremia* Guen., in Duponchel's Cat., 219, 1844."

Larentia H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Coremia Steph., Cat. Br. Lep., 186, 1850.

Cidaria Lederer, Verh. Bot. Zööl. Ges. Wien, 182, 1853.

Coremia Guen., Phal., ii, 108, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1303, 1862.

Head much as in *Petrophora*; the front being of the same width and fullness, with or without an interpalpal tuft. Antennae either with long, fine pectinations extending nearly to the end, or flattened and densely ciliated.

Palpi short, not extending far beyond the head; the second joint wide; third short, conical, and usually merged in with the second joint, not free as in *Petrophora*. Fore wings slightly subfalcate, with the costa regularly arched, the apex acute, and the outer edge very oblique; or the wing is shorter, scarcely subfalcate, and the apex obtuse. The hind wings are short, full, and either shaped as in *Petrophora* or slightly angled; on the outer edge, sometimes the angle is well marked. The wings project well beyond the end of the abdomen, which is short and thick; much shorter than in *Petrophora*, with similar, but less marked, dorsal and lateral tufts, and with an obtuse anal tuft. The venation differs from that of *Petrophora* in the first subcostal venule being longer, while the second and third are shorter. The discal venules are always perfect; the anterior one being straight or oblique, and the posterior one oblique and usually much bent. There are usually two subcostal cells, either very unequal (*O. ferrugata*, pl. 1, fig. 8), or large and subequal, as in the closely-related species *O. designata* (fig. 8a); or, as in *O. lignicolorata* (fig. 8b), there is but one small cell, and the first costal arises some distance from it. Hind tarsi a little shorter than the tibiae. Coloration: usually with many zigzag lines on the fore wings, arranged sometimes in a broad, dark, conspicuous, median band, and toothed prominently externally; numerous fine, scalloped, more or less distinct, lines on the hind wings.

This genus differs from *Petrophora* by the shorter palpi, the pectinated antennae, or, when ciliated, by the dense cilia, and by the short, thick male abdomen not extending as far as the inner angle of the wing, which is sometimes distinctly angled.

There is a good deal of variation in the generic characters given above in the different species, particularly in the condition of the palpi and antennae, as well as in the venation; but there is much similarity in the markings, and, as a whole, the genus is tolerably easy to distinguish, certainly as much so as some of the genera in other subfamilies; as, for example, the *Acidulina* or *Geometrinae*.

Larva.—"Caterpillar elongated, attenuate anteriorly, cylindrical, marked with black points in the incisions; head small and globular; living on low plants. Pupa subterranean."—Guene'e.

*Synopsis of the Species.*A. Wings, especially hinder pair, long, produced toward the apex,
much as in *Petrophora*:

- Male antennae heavily pectinated; inner and outer edge of mesial band heavy and dark *O. munitaria*.
 Male antennae heavily pectinated; wings wood-colored. *O. lignicoloraria*.
 Male antennae slightly pectinated; ciliated; wings light ash; intradiscal band heavy *O. abrasaria*.
 Antennae simple; wings pale ash, with flesh-colored bands; inner edge of middle band no heavier than the outer; a submarginal coffee-colored band, edged externally with white. *O. gueneata*.
 Like *gueneata*, but smaller, and edges of middle band less marked; a general flesh-colored tint *O. carneata*.
 Fore wings tinged with reddish; hind wings bright red *O. rubrosuffusata*.
 Smaller than the preceding; cream-white bands on fore wings, and cream-colored hind wings. *O. lactata*.

B. Fore wings usually shorter, hind wings much shorter, than
in section A:

- Antennae simple; wings short, pale-whitish; inner edge of roseate band heavy and black *O. designata*.
 Antennae pectinated; wings short; middle band black and heavy or rust-brown. *O. ferrugaria*.

OCHYRIA MUNITARIA Hübner. Plate 8, figs. 66, 67.

Geometra munitata Hübn., Schm. Eur., 346, 1803. ?

Cidaria munitata Steph., Ill., iii, 315, 1831.

Cidaria munitaria Bours., Gen. Ind., 214, 1840.

Larentia munitata H.-Sch., Schm. Eur., 167, fig. 346; Suppl., 70, 1847.

Coremia munitata Guen., Phal., ii, 409, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1304, 1713, 1862.*

Coremia labradoriensis Pack., Proc. Bost. Soc. Nat. Hist., xi, 46, 1867.

Cidaria striata Pack., Proc. Bost. Soc. Nat. Hist., xi, 50, 1867.

Coremia californiata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 328, 1871.

5 ♂ and 3 ♀.—This very variable species may be known by its heavily pectinated antennae, in which respect it closely resembles *O. lignicolorata*. The style of markings is much as in *O. designata*; but the fore wings are much longer and more pointed than in that species. Fore wings pale whitish, with the median band usually dark or reddish-brown, the inner edge of which is heavy and blackish, while on the outer edge are three parallel lines, much as in *O. designata*; the edge is angled in much the same way as in *designata*. Beyond are two rows of black venular spots, a subapical black and oblique line. There are sometimes traces of four or five lines on the hind wings.

Length of body, ♂, 0.40, ♀, 0.40; fore wings, ♂, 0.52, ♀, 0.54–0.65; expanse of wings, 1.00–1.20 inches.

* Standinger gives the following synonyms, which I have had no opportunity of verifying: *decoloraria* Esper., 50, 5 (prior to *munitata* ?); *arcticaria* Germ., Fn. l. E., 16; Zetterstedt, Ins. Lap., 934; *collinaria* Metzner, Stett. Ent. Zeit., 238, 1846; Fr., 521, l.

Caribou Island, Southern Labrador, July 28, August 6 (Packard); Philadelphia, Pa. (Amer. Ent. Soc.); Colorado (Ridings); mountains of Colorado, June 21, July 19, Sept. 8 (Carpenter, Hayden's Survey); California (Edwards); Mendocino, Cal. (Behrens); Victoria, Vancouver Island (Crotch).

The Californian and Rocky Mountain examples are shaped like the Icelandic ones, but with the inner edge of the mesial band on the fore wings heavier. The females are much larger than eastern ones, expanding 1.50 inches. The single Pennsylvanian individual does not differ from the western examples. The Labrador examples usually have heavier markings, and in nearly all cases shorter wings than in the Icelandic or Californian examples. A single Labrador example agrees well with an Icelandic one which differs a little from the normal form, the median band being very broad, with the edges less heavy than usual. Western and Californian examples have the fore wing 0.62 inch long.

I append a description of the example I described as *strigata*:

Male antennae well pectinated, dark, concolorous with the front and the palpi, which are long and slender, especially the third joint. Fore wings with two basal lines; a broad, black band, contracting greatly just before the hind edge, where it is about one-third as broad as on the costa; a broad mesial tooth on the outer edge, below a little sinuated. This band is accompanied on the outer edge by a marginal dusky band. Beyond is a row of fine, nervular, black dots; a submarginal, white, zigzag line, going obliquely to the apex. On the costa is a subapical pair of black stripes, the inner of the two being oblique. The hind wings are pale, with very faintly-marked lines; luteous beneath toward the apex; two dark lines beneath, the outer one consisting of dots. Discal dots distinct. Abdomen dusky, with the segments edged with white.

Length of body, 0.40; of fore wing, 0.50 inch.

Differs in its broadly-pectinated antennae, the broad, mesial, black band narrowing rapidly on the inner edge; also, by the distinct discal dot, and the quite distinct dusky line along the outer margin of the band, with the distinct, oblique, black line on the costa near the apex, and the black dots beneath the spot on the nervules.

August 3, Caribou Island, Labrador.

Var. *labradorensis*.—♂.—Allied to *O. d. signata*, but the antennae are much more finely ciliated. Palpi as usual. Body dark cinereous, with black

scales, and some of a slightly reddish tinge. Abdomen with a pair of oblique, diverging, black streaks on each ring. Base of the wing brown; beyond, a broad, cinereous band; a broad, brown, mesial patch; the inner side regularly curved outward, not zigzag, but with the edge entire, with a broad, black line; in the middle of the band two dark, slightly oblique, sinuate lines; the outer side of the band is very irregular, consisting of two large, unequal, subacute teeth, the lower larger and double; below, the band contracts, being bidentate on the outer edge, which is black; beyond is a row of nervular dots; the usual submarginal, whitish, zigzag line, with the edge black between the nervules; fringe dusky. Hind wings with indistinct, dusky, zigzag lines. Beneath, the outer side of the mesial line is partially reproduced, especially on the costa. Discal dot distinct, especially on the hind wings, which are crossed by two outer, black, irregular lines.

Length of body, 0.40; of fore wing, 0.55 inch. Length of Californian example also 0.55 inch, but the wing is narrower.

The distribution of this species in the Old World is thus given by Staudinger: Saxony and mountainous parts of Silesia; Alps; Austria; Switzerland; Piedmont; England; Iceland; Lapland; Finland; and Livonia.

Larva.—"The Rev. Joseph Greene has reared this moth from the egg, which was hatched in June. The young caterpillars fed on groundsel during the autumn; they grew very slowly; before winter they left off eating altogether, but in early spring again ate the groundsel, and were full-fed before the end of March. The caterpillar, when full-fed, is an inch in length; the ground-color dull green or brown, but very variable; the segments pink or flesh-colored; the body is slightly sprinkled with black dots, with two very distinct blotches on the sixth and seventh segments, the latter being the largest. It spins up in moss, and turns to a brown chrysalis."—Newman's British Moths, 168.

OCHYRIA LIGNICOLORATA Packard. Plate 8, fig. 59.

Corcia lignicolorata Pack., Sixth Rep. Peab. Acad. Sc., 42, 1871; Proc. Bost. Soc. Nat. Hist., xvi, pl. 1, fig. 11, 1871.

3 ♂ and 3 ♀.—Allied closely to *O. munitaria* in the form of the wings, and in its style of coloration. The wings are almost subfalcate, and the antennae, which are pectinated to the tip, are more strongly pectinated than in *O. munitaria*, the branches being as long as the head is broad on the vertex.

Palpi large and stout. Body and fore wings of a peculiar wood or nut-brown color, resembling the peculiar shade of *Hibernia tiliaria* Harris, or of a decided pale gray. Head a little paler than the palpi and thorax. Abdomen of the same color as the thorax, with two obscure rows of dark spots. Fore wings nut-brown, with fine, dark, venular dots arranged in numerous obscurely marked lines. A dark, oblique, apical line. A broad, deeper shade crosses the middle of the wing; the inner edge situated on the inner one-third of the wing, and quite regularly curved outward; the outer edge situated on the outer third of the wing; straight, with one large, obtusely triangular tooth in the middle of the wing. The edge within is made up of deeply-scalloped, fine lines, and the middle of the band is occupied with a row of ringlets, which increase in size toward the costa. A very faint, finely zigzag, submarginal, pale line. A row of marginal, intervenular, black dots. Hind wings slightly paler than the anterior pair, with numerous fine dots arranged as on the fore wings, but obsolete toward the base of the wings; a single, much-curved, darker line just beyond the middle of the wing, the line at its bend forming an obtuse angle; beneath, scarcely paler than above, with no lines or any markings except the venular dots like those above.

Length of body, ♂, 0.43, ♀, 0.42; of fore wing, ♂, 0.63, ♀, 0.63; expanse of wings, 1.16 inches.

New York, August 24 (Mead); California (Edwards): Sanzalito, Cal., Feb. 9, April, May 3 (Behrens).

This differs from all the other species known to me in the well-pectinated antennæ, the subfalcate wings, and its peculiar nut-brown color, with the single, broad, darker band, in the middle of which is a row of ringlets.

The New York example, received from Mr. Mead, does not differ from those from California.

OCHYRIA ABRASARIA Packard. Plate 8, figs. 57, 58.

——— ? "*abrasaria* H.-Sch., Neue Schm., 27, May, 1856; Schm. Eur., vi, 137, 1856."

"*Cidaria abrasaria* Staudinger, Stett. Ent. Zeit., 335, 1861."

Coremia ligularia Guen., Phal., ii, 417, 1857.

——— ? "*baicalata* Brem., Lep. Ost-Siberiens, 86, vii, 15, 1861."

Cidaria nigrofasciata Pack., Proc. Bost. Soc. Nat. Hist., xi, 49, 1867.

3 ♂ and 3 ♀.—Front full, hairy, cinereous, with black scales. Palpi long and slender, porrect, extending far beyond the front; second joint bushy, broad at the tip; third joint acutely conical, depressed. Antennæ dark,

stoutly ciliated, with short, stout pectinations. Thorax concolorous with the front. Wings pale cinereous, with two fine, basal, black, parallel lines, bent on the costa: a broad mesial band, deep black on the edges, consisting of four bands, the outer ones heaviest, and shaded diffusely within with black, two-thirds as wide on the inner edge as on the costa; a faint discal streak; the outer line of this broad band is very black, straight on the costa; on the first median vein, it has a large, acute tooth, of which the lower side is nearly continuous with the course of the band; on the costa, one-half way between this band and the apex, is a square, dark spot, margined with white externally, which is the beginning of a white zigzag line, continued to the inner edge of the wing; beyond the edge of the wing is dusky, with a marginal row of geminate, intervenular, fine, black dots; fringe dusky at base, paler on the outer half. Hind wings with no discal dot; two outer, zigzag, dark lines parallel with the dusky edge of the wing, and a row of geminate, black dots and fringe, as on the primaries; beneath, pale, with a luteous tinge; on the basal fourth of the costa is a conspicuous black spot; a mesial, curved, linear, costal line; beyond is a sinuate, black line, most distinct on the costa; outer edge of the wing dusky; fringe as above. Discal dots distinct on both wings. An outer, curved, sinuate line, especially marked on the veinlets. Fringe paler than on the fore wings. Abdomen pale-ashen, with a dorsal row of black, geminate dots.

Length of body, ♂, 0.40–0.45, ♀, 0.40–0.45; of fore wing, ♂, 0.43–0.60; expanse of wings, 1.00–1.15 inches.

Caribon Island, Labrador, August 2 (Packard); Brunswick, Me., July 6 (Packard); Mount Washington, N. H., July 7 (Sanborn); early in August (Seudder); Beaver Brook, Colorado, August (Uhler, Hayden's Survey); California (Edwards and Behrens); Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.).

This species may be easily recognized by its minutely-pectinated antennae, each branch of which ends in a slight tuft of long cilia; by the long, dark palpi, paler at the tip, the broad mesial band, both black on the outer and inner edges, and not narrowing on the inner edge so much as usual; by the broad dusky patch between this and the apex, margined externally by a white line; and by the hind wings having two distinct waved lines on the outer half, and also by the very distinct double row of black abdominal spots.

When rubbed, the Californian examples look as in fig. 58. The Pacific-

east male specimens are paler and considerably larger than New Hampshire (subalpine), Labrador, and Iceland male examples; the length of fore wing in all the eastern examples being 0.50-0.52 inch, while in Pacific coast specimens it is 0.60 inch.

Staudinger gives the following distribution of this species in the Old World: Northern Lapland; Finland; and Eastern Siberia.

OCHYRIA GUENEEA, *n. sp.*—Plate 8, fig. 60.

3 ♂ and 3 ♀ —Male antennae simple. A general flesh-colored tint on the wings. Fore wings with a heavy, angulated, basal line, with parallel lines within and without the broader line. A broad, median, dark band, pale in the middle, with the edges heavy and dark. The inner edge sends a sharp angle outward from the base of the wing, an obtuse angle on the median vein, and a larger angle on the internal vein. The middle of the band is whitish, with a distinct discal dot. The outer edge of the band is angled, much as in *O. nannitaria*; there being a large sinus in the discal space, the angle below being large and well marked, while still below is a deep sinus. Beyond this band is a broad, coffee-colored, diffuse band, not present in any of the other species. This band is sometimes interrupted, but is always edged externally with an interrupted, rather distinct, white line. The hind wings are pale flesh-brown, with traces of three diffuse light-brown lines and a discal dot; the two outer of these lines form beneath broad, irregularly-scalloped bands, the outer very heavy, and edged externally with white. The outer edge of the middle band on the fore wings is reproduced distinctly on the costa, but faintly on the hinder part of the wing. The fringe is checkered with brown more distinctly beneath than above.

Length of body, ♂, 0.50, ♀, 0.40; fore wing, ♂, 0.57, ♀, 0.56; expanse of wings, 1.20 inches.

Sanzalito, Cal., January 26, July 16 (Behrens); San Diego, Cal. (Crotch, Mus. Comp. Zool.); California (Edwards); Sierra Nevada (Crotch).

This species differs from the others in the flesh-brown tints, and the submarginal, broad, coffee-colored band. M. Guenée, to whom I sent specimens, writes me that this is neither his *Corynia conradtaria* nor *detrita*. I accordingly take pleasure in dedicating this species to the author of the best work yet published on the group.

OCHYRIA CARNEATA Packard. Plate 9, fig. 3.

Phthalapteryx carnata Pack., Sixth Rep. Peab. Acad. Sci., 43, 1874; Proc. Bost. Soc. Nat. Hist., xvi, pl. 1, fig. 9, 1874.

2 ♂.—This species has the style of markings of a *Petrophora*; not having the numerous straight, wavy lines of *Phthalapteryx*. Palpi unusually long, beak-like. Fore wings produced toward the apex, which is, however, rather more rounded than usual. Hind wings more produced toward the apex than usual. Body and wings pale ash. Fore wings dull ash at base, and with a broad flesh-colored band, contracted on the submedian vein, where it is edged on both sides with black: the flesh-color is less distinct on the costa, where there are gray streaks; a broad, dark, cinereous band crosses the middle of the wing, darker on the edges, and with a series of obscure ringlets along the middle; the outer edge has three scallops in the middle, larger and projecting more than the others; beyond this band, the wing is flesh-colored again, with a fine series of black venular dots in the middle of the caraneous band; the latter is bordered externally by a fine, white, scalloped line; a row of fine black twin spots along the edge; fringe dark cinereous, interrupted by darker, slightly-marked, venular spots. Hind wings whitish-ash, with three obscure scalloped lines, the outer one being the heaviest, dark cinereous, and edged with snow-white externally; a faint discal dot; edge of wing with a conspicuous, interrupted, black line; fringe pale ash. Abdomen with a row of dark dorsal spots, as usual in the genus. Two anterior pairs of legs, gray, ringed with white. Beneath gray, densely speckled with darker scales; discal dots large and distinct on both wings; a square, blackish, costal spot on the basal third of the wing; another over the discal dot; a dark shade crosses the outer third of the wing, ending in a dark costal shade; a submarginal row of dark intervenular patches, lined externally with white scallops; fringe as above. Hind wings much more speckled than usual, with three scalloped lines, the outermost very heavy and conspicuous.

Length of body, 0.42; of fore wing, 0.53; expanse of wings, 0.95–1.00 inch.

California (Edwards).

This form may be recognized by the two broad flesh-colored bands on the primaries, the long, large palpi, and the heavy outer line of scallops on the under side of the secondaries.

OCHYRIA RUBRO-SUFFUSATA Packard. Plate 8, fig. 61.

Ochyrus rubro-suffusata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 1871.

4 ♂ and 2 ♀.—In this interesting species, the palpi are rather short and blunt, hairy; the front being unusually hairy, the scales standing up more than usual. Body and antennae black, with scattered white scales. The fore wings slightly suffused with red as a ground-color; the hind wings clear brick-red. Fore wings thickly covered with dark bands; base of wing blackish, succeeded by a narrow reddish-brown line, slightly curved; beyond is a dark band, scarcely curved, and succeeded by a salmon-colored band, with a dark, thread-like line running just beyond its middle; the middle of the wing is blackish, with three black, wavy lines running through it; the discal dot round and black, being situated nearly on the innermost of the three; this broad dark band is more curved on its inner side in the male than in the female, and is narrower; the outer edge is sinuate, with a dentate projection on the first median space; beyond this band is a clear, dull, salmon-colored band, with a wavy, dusky line running through it, while the edge of the wing is dull-brown; a marginal row of black, subtriangular spots; fringe brown at base; beyond, obscurely checkered with reddish and dusky spots. Hind wings brick-red; about six short, fine, wavy lines on the inner edge, disappearing in the middle of the wing; a very distinct row of black, marginal, intervenular spots, and fringe as on fore wings. Under side of both wings red; hind wings deeper red than fore pair, crossed by fine, black, interrupted lines, three on each wing; discal dots black, and costa of fore wings with about seven black dots, the subapical one largest; base of fore wings crossed by two dark lines, forming three black circles; fringe as above, but duller.

Length of body, 0.30; of fore wing, 0.44–0.50; expanse of wings, 1.00 inch.

Nevada (Edwards); San Mateo, Cal. (A. Agassiz, Mus. Comp. Zool.).

This species may at once be recognized by the brick-red hind wings and under side of all the wings, the hairy front, and blunt, hairy palpi.

In one female, the ground-color is yellowish; the hind wings especially being bright yellow.

OCHYRIA LACTEATA, n. sp. Plate 9, fig. 2.

1 ♀. This beautiful little species, in the shape of the wings, especially in the acute hind wings, closely resembles *O. rubro-suffusata*; the outer edge

of the fore wings is rather fuller, but the palpi and form of the body are the same. Body brown. Fore wings brown, with very distinct white bands and lines; a basal, broad, dark band, bent at right angles below the costa; beyond is a wider brown space, succeeded by a thread-like, wavy, white line, the largest wave being in the discal space; beyond this is a broad blackish band, and beyond an equally broad, pure-white band, inclosing a round, black, rather distinct discal dot; half-way between the white band and the outer edge is a zigzag white line, bent at nearly right angles below the costa, and curved outward in the middle of the wing, with several joints in the curve; the sinus in the discal space is filled with a large black blotch; a black, oblique, apical line, quite distinct; a marginal row of black dots; fringe pale, checkered with dark. Hind wings subacute, of a soft, decided cream-color, with no lines, but a small discal dot, and a submarginal row of black dots; fringe concolorous with the rest of the wing; beneath, ochreous cream-color, with four large, distinct, discal dots; an extradiscal line, more or less diffuse, widening on the costa; apical region brown, but the apex itself with a clear triangular spot. Hind wings more clouded than the fore wings; two parallel scalloped lines beyond the discal dots, and a submarginal line.

Length of body, ♀, 0.30; of fore wing, ♀, 0.40; expanse of wings, 0.84 inch.

Sanzalito, Cal. (Behrens).

This fine species differs from *O. rubro-suffusata* in the white bands on the fore wings, and the cream-colored hind wings, and in the under side of both wings being cream-colored.

OCHYRIA DESIGNATA Packard. Plate 8, fig. 63.

"*Geometra designata* Hufnagel, Berlin, Mag., iv, 612, n. Cat., 1769."

"Rottenburg, Ann. Hufn., Tab. Schm., xi, 85, 1777."

"Boeldt, Eur. Schm., v, 385, 1791."

Geometra propugnata Denis and Schiff., Verz., 112, 1776.

"Fabr., Mant., 205, 1787."

"Hübner, Schm. Eur., 286, 1797."

Ochyria propugnata Hübner, Verz., 334, 1818.

Calaria propugnaria Treits., Schm. Eur., vi (in), 111, 1828.

Calaria propugnata Steph., Nomencl. Br. Ins., 41, 1829.

Eubolia propugnaria Dupr., Lep. France, viii (v), 181, pl. 183, fig. 5, 1830.

Calaria propugnata Steph., Ill., iii, 220, 1831.

Boisd., Gen. Ind., 214, 1840.

Larentia propugnaria H. Sch., Schm. Eur., iii, 147, 1847.

Corenoc propugnata Steph., Cat. Br. Lep., 188, 1850.

Guen., Phal., ii, 412, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1304, 1862.

Cobesia designata Zeller, Verh. Bot. Zool. Ges. Wien, xxii, 494, 1872.

10 ♂ and 10 ♀. Of the size and form of *O. ferruginea*, but the antennae are simple, being ciliated. Body and wings pale whitish ash. Fore wings whitish ash, reddish at base, the red portion limited by a dark curved line situated near the insertion of the wings; beyond is a broad light space with two dark, faint, thread-like lines; just within the middle of the wing, a conspicuous, broad, blackish, even band, a little curved outward below the costa; the extradiscal line narrow, black, straight in the costal region, though wavy; below making a deep sinus in the discal space, and a large angular projection in the first median space, and below curved and wavy in its course; the median band is roseate, or light brick-red, and, near the outer edge, contains two parallel, slightly sinuous, dark threads, bent outward below the costa; a large, costo-apical, squarish, reddish-brown spot; a submarginal, wavy, white line; no discal dot; fringe concolorous with the rest of the wing. Hind wings whitish gray, concolorous with the anterior pair, and with seven or eight fine wavy lines, and a zigzag, white, submarginal line; beneath, both wings with numerous common lines, of which the extradiscal is the most distinct; discal dots very distinct.

Length of body, ♂ 0.35, ♀, 0.38; of fore wing, ♂, 0.45, ♀, 0.48; expanse of wings, 0.96 inch.

London, Canada (Saunders); Brunswick, Me., abundant in midsummer about houses (Packard, Mus. Peab. Acad. Sc.); Dublin, N. H. (L. W. Leonard, Harris Coll. Mus. Bost. Soc. Nat. Hist.); Milton, Mass., May 25, June 1, July 15; Cambridge, Mass., May 20, August 1-25 (Harris Coll. Mus. Bost. Soc. Nat. Hist.); Dedham, Mass. (F. W. Very, Mus. Peab. Acad. Sc.); Salem, Mass., June 9 (Cassino); North Beverly, Mass., May 20, June 12-16 (Burgess); Ithaca, N. Y., May 31 (Comstock, Mus. Corn. Univ.); Oneida, N. Y. (R. V. Hawley); Easton, Pa. (Stultz); Philadelphia, Pa. (Ent. Soc.).

This is the common typical American form, Guenée's var. A. I have no European examples with which to compare it. Three Iceland specimens only differ from these in the median band being less roseate, and with a decided brownish tint. This is Guenée's var. B.

This form may be recognized by the simple antennae, the pale, quite clear, ash-colored wings, and the broad, median, roseate band, limited within by the conspicuous, black, slightly-curved band.

Staudinger gives the following distribution in the Old World: Northern

and Central Europe: Piedmont: Northeastern Turkey: Southern Russia: Altai Mountains: Eastern Siberia: Iceland.

This species is double-brooded, appearing in May and also in July, as it is in Europe.

Larva.—“The caterpillar is figured in Sepp’s exquisitely beautiful work on Dutch Lepidoptera. It is represented feeding on a species of cabbage (*Brassica*). The ground-colour is a reddish-gray, with a medio-dorsal series of triangular markings of a rosy-pink, and a lateral stripe in the region of the spiracles of a dingy-yellow.”—Newman’s British Moths, 168.

“Larva reddish-gray, with a row of pink triangles on the back: spiracular line pale yellowish-grey (Sepp). On cabbage in September.”—Stainton’s Manual of British Butterflies and Moths

OCHYRIA FERRUGARIA Hübner. Plate 8, fig. 62.

“*Gemmetra ferrugata* Clerck, Icon. Ins., 6, 44, 1759.”

“Linn., Fauna Suecica, 338, 1761.”

“Borkh., Eur. Schm., v, 387, 1794.”

“Hübner, Schm. Eur., 169 (285?), 1796.”

“*truncatella undulataria* Haw., Lep. Brit., 398, 1863-29.”

Cidaria ferrugaria Treits., Schm. Eur., vi (iv), 148, 1828.

Cidaria ferrugata Steph., Nomencl. Br. Ins., 44, 1829.

Eubolia ferrugaria Dup., Lep. France, viii (v), 181, pl. 183, fig. 6, 1830.

Cidaria undulataria Steph., Ill., iii, 215, 1831.

Cidaria ferrugata Steph., Ill., iii, 216, 1831.

Larentia ferrugaria H.-Sch., Schm. Eur., iii, 149, 1847.

Coremia ferrugata Steph., Cat. Br. Lep., 186, 1850.

Coremia undulataria Steph., Cat. Br. Lep., 187, 1850.

Coremia ferrugata (and var. *undulataria*) Guen., Phal., ii, 413, 1857.

Walk., Ill. List Lep. Het. Br. Mus., xxv, 1305, 1802.

Cidaria ferrugata Zeller, Verh. Bot. Zool. Ges. Wien, xxii, 495, 1872.

10 ♂ and 10 ♀.—Male antennae well pectinated, front brown; palpi long and stout, brown, pale cinereous beneath; a transverse black band on the prothorax; behind, on mesoscutum, brown scales. Abdomen pale cinereous, with a row of blackish spots on each side very conspicuous. Base of fore wings with distinct reddish-brown bands, alternating with pale lines, the inner one broadest; within, at the base, dark; in the middle of the wing, a broad black band, with a large angle on the outer side; edge finely dentate, lined externally with white; the dark band is traversed by darker, deep black, and pale lines; discal dot small, black, indistinct; beyond, and greatly widening on the costa, are two parallel brown lines, which end in the middle of the wing; a submarginal, scalloped, white line, and running just outside of a black, very

distinct, gemmate spot in the discal space; edge of wing darker; fringe all-coloured, darker at base. Hind wings dusky within; discal dot distinct beyond lineated obscurely with a few brownish scales. Beneath discal dot distinct, dark cinereous, with transverse black, scalloped dusky lines, an outer dark line, and a submarginal white line lined with dusky virlin, with two finer lines between the discal dot and outer line.

Length of body, ♂, 0.35, ♀, 0.33; of fore wing, ♂, 0.50, ♀, 0.45; expanse of wings, 0.90–0.95 inch.

Quebec, Canada (F. N. Bélanger); London, Canada (Saunders); Brunswick, Me., common, July 10 (Packard); var. *undentaria*, Mount Washington, New Hampshire, July 8 (Morrison); August 16 (Shurtleff, Mus. Bost. Soc. Nat. Hist.); New Hampshire (Leonard, Harris, Mus. Bost. Soc. Nat. Hist.); Milford, N. H. (Mus. Bost. Soc. Nat. Hist.); Milton, Mass., May 25, July 15; Salem, Mass., attracted to lights, May 25 (Packard); Springfield, Mass., July 19 (Dimmock); Brookline, Mass., August 18 (Boston (Shurtleff and Sanborn, Mus. Bost. Soc. Nat. Hist.); Nahant, Mass. (Moering); West Farms, N. Y. (Angus); Brewster's, N. Y. (Grote); var. *undentaria*, Long Island, N. Y. (Graef); Philadelphia, Pa. (Ent. Soc.); Wisconsin (Mus. Peab. Acad. Sci.).

This species also is double-brooded, appearing in May and again in July, as in Europe.

This moth is abundant everywhere, and differs from the equally common *O. designata* in the pectinated antennae, very broad, black, or dark brick-red middle band, bordered on each side with light-reddish wavy lines. The black variety seems to be as abundant as the red, more typical form. It seems to be less exposed to variation than in *O. designata*. The black or red band varies much in width, and the discal dot in distinctness. In some specimens, the median band is of a rich wine-brown hue. In some examples, the median band is centered by a row of dark oval spots. Our brown examples, on comparison with one example from North Germany, received from Professor Zeller, do not show any differences. Our black variety seems to be identical with Haworth's *undentaria*, common in England. Stainton retains this as a distinct species from *peragaria*, though he states that "the larva is undistinguishable" from that of *peragaria*. Standinger also regards it as a distinct species, stating that it occurs in England, Northern Germany, and, doubtfully, in Finland and Livland. I am inclined to regard it only as a

variety of *ferrugata*, and a good example of melanism, as it occurs only in Northern Europe, and none have yet occurred in the Southern United States south of Massachusetts, though our knowledge of the distribution of this species in America is exceedingly imperfect.

The localities of *ferrugaria* (not including *unidentaria*), given by Staudinger, are as follows: Europe (excluding Andalusia, Sardinia, and Greece); Bithinia; Altai Mountains; and Amur.

Larva.—The eggs are generally laid on the stems of ground-ivy (*Glechoma hederacea*), on the leaves of which plant the caterpillars feed. The period in the egg-state varies from ten to twenty days, according to the temperature; the cold east winds, which so frequently prevail in the spring, greatly retarding their emergence. The full-fed caterpillar rests with the anterior extremity rigidly extended, but often in a slightly-arched position. When annoyed, it tucks in its head, and rolls up the anterior part of its body in the form of the Ionic volute. The legs are crowded together and closely appressed to the mouth; the head is prone, not conspicuously notched on the crown, and nearly of the same width as the body; the body is of nearly the same width throughout, and uniformly cylindrical, with the exception of a lateral skin-fold, which extends its whole length; it is without humps, but, in common with the head, has a few small scattered warts, each of which emits a single small bristle; the head is putty-colored, freckled with black on the face, and having a darker stripe on each cheek; the color of the dorsal area of the body, as far as the ninth segment, is dingy-brown, but this hue appears to be caused by the somewhat tessellated ornamentation; this consists, in the first place, of a medio-dorsal stripe, narrow and almost thread-like, on the third, fourth, fifth, tenth, eleventh, and twelfth segments; on the sixth, seventh, eighth, and ninth segments, the medio-dorsal stripe is interrupted, and reduced to a median, intensely black, spot; each of these black spots is surrounded by a paler area, dilated laterally, but attenuated at the extremities; a dorsal series of lozenge-shaped markings results as far as regards these four segments; on each side of this dorsal ornamentation are three slender rivulet stripes, all of them sesquialterous or semi-double, but neither of them very conspicuous; the ventral area, extending to and including the spiracles, is putty-colored, but the spiracles themselves are intensely black, and surrounded by a paler area; there is a medio-ventral, pale-brown, or reddish stripe, containing three black spots, and extending from the fifth to the twelfth segment;

on each side of this medio-ventral stripe, the ground-color is extremely pale and the pale part is bounded by a double, sinuous, darker stripe, very similar to those on the dorsal area: this commences at the base of the third pair of legs, and ceases at the base of the ventral claspers: this is again succeeded by a paler ground color, and this again by a frequently interrupted and most irregular stripe, which contains five conspicuous black spots, and terminates in a large linear spot close to the ventral claspers. The caterpillar spins a slight web among the stolons of the ground-ivy, and in this changes to a smooth brown chrysalis." —Newman's British Moths, 168.

Desiderata.

Coronia courallaria Guen., Phal., ii, 410, 1857. — Elle est très-voisine de notre *munidata*. La couleur des supérieures est le testacé-rougeâtre ou rosé, avec l'espace médian formant une bande absolument de même forme que chez *munidata*. Il est traversé de lignes plus ou moins visible, qui laissent au milieu tantôt une bande, tantôt une simple tache claire, au milieu de laquelle est un petit trait cellulaire. On voit plus loin un trait subapical et au-dessous, une ombre; mais entre elle et l'espace médian, je ne vois ni lignes ondulées ni points. Les ailes inférieures sont claires, avec le bord teinté de rosé et une ligne médiane indistincte et plus arrondie au milieu. Les lames des antennes sont plus robustes.

Californie. Deux ♀. Coll. Gu.

Coronia defensaria Guen., Phal., ii, 411, 1857. — Elle est encore très-voisine de la *munidata* et surtout de la *courallaria*, mais les ailes supérieures sont plus obscures: l'espace médian forme un angle extérieur beaucoup plus saillant quoique obtus; la subterminale est distincte, découpée en dents arrondies, et, entre elle et la coudée, on voit trois rangées de petits points nervuraux noirs. Deux ou trois rangées semblables se voient aux ailes inférieures, entre la ligne médiane et le bord terminale. Tous ces points se répètent en-dessous avec deux traces de lignes près de la base, tandis que chez la *courallaria* il n'y a que le point cellulaire et une seule ligne. Les lames des antennes sont encore plus robustes et un peu claviformes.

Californie. Un ♂. Coll. Boisduval.

Coronia phbeculata Guen., Phal., ii, 419. — 20^{mm}. Ailes supérieures d'un gris-noirâtre mêlé d'ochracé, avec un large espace médian plus foncé, traversé

par de fines lignes: la coudée n'ayant qu'un seul angle arrondi entre 2 et 3. Le bord terminal est également obscurci, à lignes, du reste, peu distinctes, mais de manière qu'il se découpe, entre lui et la coudée, une bandelette plus claire et plus jaunâtre, traversée d'un filet comme chez les *Emmecesia*. Ailes inférieures d'un jaune pâle, avec quatre lignes noires commençant au bord abdominal, mais se perdant avant le milieu de l'aile. De petits points triangulaires, isolés, noirs, bordent les quatre ailes. Le dessous est d'un jaune d'ocre clair: les inférieures ont plusieurs petites lignes noirâtres, denticulées et comme punctiformes. Antennes sans ciliations.

Californie. Un ♂. Coll. Guenée.

Je n'ai vu qu'un seul individu de cette petite espèce et n'oserais affirmer qu'elle appartienne définitivement au genre *Coremia*. Elle a un aspect tout-à-fait distinct.

Cidaria algidata Moeschler, Ent. Zeit. Stett., 35. Jahrg., 162, 1874.—This Labrador species has pectinated antennae, and is apparently a pale variety of the very variable *O. munitata*.

Cidaria inclinataria Walk., List Lep. Het. Br. Mus., xxvi, 1727, 1862.—This, as I learned by an examination of the type in the British Museum, is a true *Ochryia*.

RHEUMAPTERA Hübn. Plate 1, fig. 10.

Rheumaptera Hübn., Faun., 1863-40.

Mesoleuca Hübn. (in part), Verz., 326, 1818.

Xanthorhoe Hübn., Verz., 327, 1818.

Phaegria Hübn. (in part), Verz., 327 (not *Phaegria*, p. 334), 1818.

Epierhoe Hübn., Verz., 328, 1818.

Eulype Hübn., Verz., 328, 1818.

Calostigia Hübn., Verz., 328, 1818.

Zerene Tröts. (in part), 8 Ann. Ent., vi (n), 217, 1828.

Cidaria Steph., Nomencl. Br. Ins., 11, 1829.

Melanthia Bours. (in part), Gen. Ind., 216, 1840.

Melanthe Dup., Lep. France, suppl. to vol. iv, 112, 1842.

Larentia H. Sch. (in part), Schum. Eur., iii, 119, 1847.

Coremia Steph. (in part), Cat. Br. Lep., 186, 1850.

Harpalus Steph. (in part), Cat. Br. Lep., 190, 1850.

Melanippe Steph., Cat. Br. Lep., 213, 1850.

Melanthia Steph., Cat. Br. Lep., 213, 1850.

Melanippe Guen., Planch., ii, 386, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1728-1, 1862.

♂ and ♀.—Head much as in *Ochryia*; the front being rather narrow, but full, with a well-marked interpupal tuft. Male antennae simple, not

* This is apparently the first time Duponchel used the term *Melanthia*; but here *Eupithecia brevicornata* is placed under it, and Boisduval had already employed the name.

ciliated. Palpi short and stout, slightly raised, extending but a short distance beyond the interpalpal tuft, rather bushy; the second joint broad; third joint minute, conical, merged with the second joint. Fore wings with the costa full, arched toward the apex, which is subrectangular, the wings not being subfilicate, as in *Ochyria*; outer edge not very oblique, sometimes slightly bent in the middle. Hind wings somewhat produced toward the apex, more so than in *Ochyria*, sometimes very slightly scalloped. Venation: one (*R. hastata*) or two subcostal veins, the latter equal, or, with the inner one, small; the posterior discal venule often not bent, sometimes much as in *Ochyria*; the second subcostal venule arises half-way between the end of the outer subcostal cell and the origin of the third subcostal. Hind legs thick; tarsi thick, short, not quite so long as the tibiae. Abdomen of moderate length, not reaching beyond the inner angle of the wing, ending in a slight square tuft. Coloration: there are three styles; in the *capicillata* group, there is a broad white band on the fore wings, and the hind wings are whiter than usual; in the second group, represented by *lacustrata*, there is a median black band, and there are numerous lines on the hind wings; in the third group, represented by *R. hastata*, the body and wings are black, with a white common band, and often large white spots in connection.

The species of this genus differ from *Ochyria* by the simple male antennae, almost entirely wanting in cilia, and the less subfilicate wings; while the hind wings are never angulated, though sometimes scalloped, as in *Ochyria*. Besides these characters, the species are nearly always distinguishable by their markings, and the general habit of the genus is different. The venation is very similar, yet slightly different. The species of the group A connect the *lacustrata* group B with *Ochyria*, while *hastata* is quite different. I see no reason why the genus, as here limited, is not as "good" as those in other subfamilies of the *Phalaenida*, and do not think that the union of all those genera under the term *Cidaria*, as insisted on by German writers, will tend to clear conceptions. On the other hand, the genera are in a degree artificial. Probably no two persons will agree on the limits of the genera of this subfamily; at least, in the present state of our knowledge.

Larva.—Caterpillars quite short, cylindrical, slightly attenuated in front, with trapezoided points, surmounted with small, quite visible hairs; without lines, or with a few lines; head globular; living on trees or low plants. Pupae contained in oval earthen cocoons."—Guene'e.

Synopsis of the Species.

A. Middle of the fore wing white; hind wings white:

- Like *ruficollata*, but with the outer edge of basal dark area regularly curved..... *R. brunneicollata*.
 Middle band white, with the head, thorax, and base of fore wings black; a large
 costo-apical patch; outer edge of basal dark area jagged..... *R. ruficollata*.

B. Middle of wing usually with a black band:

- Median band scalloped on the edge; with a subapical black patch..... *R. basata*.
 Structurally like *basata*, but with two short parallel lines near the edge in the
 extradiscal space; fore wings with a decided greenish line..... *R. parvotata*.
 Antennae pectinated; ground-color of wings chalky-white..... *R. fluctuata*.
 Like *laevistrata*, but with a decided flesh-colored tint and darker wings, while the
 point in the median band is large, tridentate..... *R. intermedia*.
 Median band heavy, black, with a simple tooth; hind wings with six well-marked
 scalloped lines..... *R. laevistrata*.
 Like *laevistrata*, but with a broad, clear, white band beyond the median band, and
 common to both wings..... *R. unangulata*.

C. Wings black, with white lines, bands, and spots:

- Medium-sized, with usually a single, broad, white, median band..... *R. lugubrata*.
 Under-sized, with two white lines and a band on the fore wings; hind wings
 marked like anterior pair..... *R. tristata*.
 Largest species of the genus, with two white lines, a band, and a submarginal
 line; hind wings marked in the same manner..... *R. basata*.

RHUTAPTERA BRUNNEICOLLATA Packard. Plate 8, fig. 69.

Metathalia brunneicollata Pack., Sixth Rep. Peab. Acad. Sci., 42, 1874; Proc. Bost. Soc. Nat. Hist., xvi, pl.
 I, fig. 10, 1874.

3 ♂ and 3 ♀.—This species is more nearly allied to our *R. ruficollata* than *R. albicollata* of Europe. Body brown, with a slight reddish tinge, giving off metallic reflections. Abdomen darker than in the two above-named species, with a fine, white line on each segment. Body and legs white beneath. Fore wings may be described as opaque reddish-brown, with a median white band much narrower than in the two other allied species; the inner angle with a deep rectangular sinus; outer edge with a large tooth opposite the unusually large discal spot; yellowish about the tooth, which varies much in size, sometimes being obsolete; above and below this tooth the edge is sinuate; in the brown region beyond are two parallel, irregularly sinuous, fine, blue lines; the outer edge of the brown region scalloped, the angles filled with white, with a squarish, white patch, and a broad patch of white in the middle of the wing, extending from near the large tooth opposite the discal dot to the outer edge of the wing, including the fringe, which is mostly brown, with a white subapical patch. Hind wings immaculate now-white; beneath white, with large discal dot; outer half of wings dark-

brown, with a long white tooth opposite the dot: a deeply-scalloped, submarginal, white line, much as above; fringe as above. Hind wings white, with a discal dot and a submarginal, interrupted, double line, more or less obsolete, and represented by scattered dots.

Length of body, ♂, 0.40, ♀, 0.35; of fore wing, ♂, 0.48, ♀, 0.52; expanse of wings, 1.05 inches.

Sanzalito, Cal. (Behrens); California (Edwards).

RHEUMAPTERA RUFIHILATA Packard. Plate 8, fig. 70.

Melipotis rufihilata Guen. l. Phil., ii, 282, 1857.

Walk. l. East. Lep. Het. Br. Mus., xxiv, 1272, 1862.

1 ♂ and 8 ♀.—Abdomen and ground-color of the wings clear white. Head, thorax, and base of fore wings blackish, with blacker lines. Fore wings with the base blackish, containing three zigzag black lines, with steel-blue scales between; edge of the area shaded broadly with brown; the edge is very irregular, with teeth projecting out on the veins, the tooth on the median vein being small, not large and rounded as in *R. brunneicollata*; a clear, white, broad mesial band, with a small discal dot, limited externally by a regularly-scalloped line, the largest scallop being in the second median space; the white band contracts on the costa, being of the same width as on the inner edge; two parallel, submarginal, broad, white, scalloped lines, ending in the large black-brown costo-apical patch; a dark patch filling two scallops above the middle and another at the inner angle of the wing. Hind wings with a discal dot; an extradiscal line; edge of the wings broadly shaded with dark scales.

Length of body, ♂, 0.45, ♀, 0.40; of fore wing, ♂, 0.60, ♀, 0.55; expanse of wings, 1.25 inches.

Quebec, Canada (Bélanger); London, Canada (Saunders); Brunswick, Me. (Packard); White Mountains, New Hampshire, July 20-30 (Scudder); Essex County, Vermont (Cassino); Brookline, Mass., June 18 (Shurtleff); Andover, Mass. (Sanborn); Amherst, Mass. (Goodell); Cambridge, Mass. (Harris Coll.); Brooklyn, N. Y. (Graef); Albany, N. Y., May 29, June 24, July 21 (Lintner); Buffalo, N. Y. (Grote); Oneida, N. Y. (Hawley); Easton, Pa. (Stultz); Lansing, Mich. (Cook).

This fine species may be identified by the white middle band, the blackish head, thorax, and base of fore wings, and the large blackish costo-apical patch.

RHEUMAPTERA BASALIATA Packard. Plate 9, fig. 2.

Larentia basaliata Walk., List Lep. Het. Br. Mus., xxiv, 1184, 1-62.

5 ♂ and 5 ♀.—Somewhat allied to *R. lacustrata* in form; but the palpi are of unusual length, rather slender, and the hind wings are a little more produced toward the apex. Body and fore wings brown; palpi blackish, tipped at extreme end with white. Head gray. Fore wings with numerous finely-scalloped dark lines; about six such lines; the median, dark, broad band is less distinct than usual, without the usual angle in the discal space, but with a large, distinct, black, discal dot; beyond the edge of this band, which has about nine scallops, is a whitish, narrow band, with a faint median, scalloped, dark line; beyond is a large black costal blotch, and a second one below, opposite the discal dot, and limited beyond by the usual zigzag, white, submarginal line; a marginal row of close-set black triangles. Hind wings whitish, usually without any markings, except the marginal row of conspicuous, black, close dots; beneath marked much as usual in *lacustrata* and allied species, the wings being clouded, with the lines faintly reproduced, and two faint lines on the hind wings, with a discal dot.

Length of body, ♂, 0.40, ♀, 0.40; of fore wings, ♂, 0.45-0.52, ♀, 0.52; expanse of wings, 0.90-1.10-1.20 inches.

London, Canada (Saunders); Mount Washington, New Hampshire, August 10 (Sanborn); Mendocino, Cal., June (Behrens); Northern California (Edwards); Victoria, Vancouver Island (Crotch).

Differing from all the other species by the scalloped edge of the median band, which is less black than usual, this species reminds one of *Ochyria designata* in the two blackish patches near the apex. The two White Mountain specimens have the hind wings darker, with traces of two lines, and are also smaller than the Californian and Vancouver Island examples, the fore wings measuring 0.16 inch; and the fore wings are a little blunter. It may prove to be identical with some European species. Those from Vancouver Island have longer, more pointed wings, and are whiter than Californian examples, and expand a line more.

This species has been identified from a drawing of Walker's type made by Mr. Willis.

RHEUMAPTERA PARINOTATA Packard. Plate 8, fig. 56.

Cidaria parinotata Zeller, *Verh. Bot. Zool. Ges. Wien.*, 1872, 45: 1872.

2 ♂ and 1 ♀.—This peculiar species is structurally much like *R. lutescens*, but with a decided green hue on the fore wings. The body and fore wings fawn-ash, with a greenish tinge on the thorax. Fore wings with a basal blackish band, formed of two wavy, parallel, approximate, black lines; the band curves regularly outward; beyond are three fawn-colored lines, and still beyond a broad, fawn-colored band, becoming greenish toward the costa; this band is enclosed between two black zigzag lines, which sometimes become diffused toward the inner edge and unite, forming a black instead of fawn-colored band; this band either touches or is quite remote on the inner edge, with a similar band, but twice as broad, beyond the middle of the wing; between the two bands is situated a distinct discal dot; near the outer edge of the wing, in the extradiscal space, are two conspicuous, parallel, short, longitudinal, black lines, somewhat like exclamation-marks; the marginal black marks are very distinct, much as in *R. basaliata*. The hind wings are dusky, with the outer edge decidedly dusky, and with a faintly diffuse dusky extradiscal line.

Length of body, ♂, 0.40–0.42, ♀, 0.45; of fore wing, ♂, 0.48–0.50, ♀, 0.55; expanse of wings, 0.95–1.10 inches.

Waco, Tex., November 5, December 5 (Belfrage, Mus. Peab. Acad. Sc.); Dallas, Tex. (Boll., Mus. Comp. Zool.).

The green fore wings and the two black, parallel, twin slashes in the extradiscal space of the fore wing separate this species from any other. Zeller remarks that it is related to *Cidaria didymata* (Linn.).

One of my specimens is the type of Professor Zeller, received from the Museum of Comparative Zoölogy.

RHEUMAPTERA FLUCTUATA Packard. Plate 8, figs. 71, 72.

Phalaena-Geometra fluctuata Linn., Fauna Suecica, 859, 4746; Syst. Nat., ed. x, 327, 4758.

"*Geometra fluctuata* Hübn., Schin. Eur., tab. 18, 249, 4796."

"Haw., Lep. Brit., 333, 1893–29."

Phenypia fluctuata Hübn., Verz., 327, 4818.

Zerene fluctuata Treits., Schin. Eur., vii (ii), 249, 4828.

Cidaria fluctuata Steph., Nomencl. Br. Ins., 44, 4829.

Melantheria fluctuata Dup., Lep. France, vii (v), 265, pl. 189, fig. 3, 4830.

Cidaria fluctuata Steph., Ill., iii, 249, 4831.

Melantheria fluctuaria Borsd., Gen. Ind., 247, 4840.

Larentia fluctuaria H.-Sch., Schin. Eur., 10, 484, 484.

Coccyzus fluctuata Steph., Cat. Br. Lep., 187, 1860.

Melanippe ulcata Guen., Phal., ii, 403, 1857.

Melanippe fluctuata Guen., Phal., ii, 402, 1857.

Melanippe ulcata Walk., List Lep. Het. Br. Mus., xxv, 1296, 1862.

Melanippe fluctuata Walk., List Lep. Het. Br. Mus., xxv, 1291, 1862.

2 ♂ and 2 ♀.—Male antennæ with rather long, very slender pectinations. Wings whiter than usual. Fore wings chalky-white as a ground-color; black at base, often with some reddish-brown scales; beyond, a broad white area, extending to the middle of the wing, with sometimes one or two parallel, faint, dark lines; the median band is twice or three times as wide on the costa as on the inner edge, and often more or less obsolete behind the median vein, where it is made up often of three large ringlets; anteriorly it is either rather heavy and blackish, with the discal dot not apparent, or it is pale in the middle, with the discal dot distinct (this band has sometimes a distinct reddish-brown tinge); beyond this median band is a broad, clear, whitish band extending to the costa; beyond its costal end is a large, square, black patch, interrupted by one or two white lines, which run in a zigzag course across the wing; below this patch, in the outer part of the extradiscal space, is a smaller black patch, filling two of the scallops of the submarginal, clear, zigzag line; the marginal row of black dots in both wings is smaller and isolated, compared with most of the allied species. Hind wings whitish, with four or five dusky lines and a discal dot.

Length of body, ♂, 0.40, ♀, 0.35; of fore wing, ♂, 0.50–0.60, ♀, 0.52; expanse of wings, 1.00–1.15 inches.

Caribou Island, Labrador, July 17 (Packard); White Mountains, New Hampshire (Shurtleff); Mount Washington, New Hampshire, July (Morrison); Treat's Island, Eastport, Me., July 16 (Shurtleff); Ithaca, N. Y. (Smith); Philadelphia, Pa. (Amer. Ent. Soc.).

This species also occurs in Europe, Asia Minor, America, and the Altai Mountains.

Differs from the allied species by the well-pectinated antennæ, the chalky-white wings, the form of the dark, distinct median band, often obsolete or very narrow behind, and in the costo-apical black patch. In the Labrador and one White Mountain (fig. 72) examples, the basal spot and median band have a decided reddish-brown tinge, while those from the Middle States are pure blackish, and much as in the European examples received from the Vienna Museum. The single Labrador specimen (expanse of wings, 1.15 inches) is much larger than any of the others, and agrees in size with the European

examples. Though my material is scanty, I do not see any reason for separating *idtuata* from *fluctuata*, which varies greatly in Europe. One large variety received from Europe is quite different from any American individual; but another is almost identical (except in being larger) with a White Mountain one.

Larva.—The caterpillar is slightly attenuated toward each extremity; it generally rests in a slightly bent posture; it is very variable in color, brown, gray, or green. I describe the brown type: the head delicately marked transversely with dark-brown; median stripe interrupted, and of various colors, of which brick-red and deep-black are most conspicuous; a small, oblong, red space, surrounded by dingy-white, occupies the middle of the hind margin of each segment after the fourth, and is united to a black spot similarly surrounded on the interior margin of the succeeding segment: the two combined constitute what Mr. Hellins terms the arrow-head markings: the dorsal surface of the tenth, eleventh, twelfth, and thirteenth segments is very pale, forming a conspicuous pale patch, and this is continued beyond the posterior margin of the ninth segment: each of the segments after the fourth has four distant and distinct white dots arranged in a square: those on the tenth, eleventh, and twelfth segments are surrounded with small black markings; the sides are pale; the belly is also pale, but has darker stripes: it feeds on the several varieties of cultivated cabbage (*Brassica*), on nasturtium (*Tropaeolum majus*), and other garden-plants, and is double-brooded, both in a state of nature and in captivity. The second brood of caterpillars is full-fed at the beginning of September."—Newman's British Moths, 164.

RHEUMAPTERA INTERMEBIATA Packard. Plate 8, fig. 73; plate 9, fig. 1.

Melipotis intermediata Guen., Phal., ii, 395, 1857.

Walk., List Lep. Her. Br. Mus., xxx, 1206, 1862.

6 ♂ and 2 ♀.—Dusky cinereous, with somewhat of a flesh-colored tint. Fore wings with two dark, parallel, wavy, black lines at the base; the base of the wing being either clear or dark reddish-brown or dusky, but not so dark as in *R. lacustrata*; beyond the dark lines and the median band, the wing is more or less cinereous, with two or three dusky lines, or sometimes a single reddish-brown band; the median band is black and heavy, limited on each side by two heavy wavy or scalloped black lines; the band varies much in width, especially near the inner edge of the wing; it also varies in the prominence of the angle on the first median vein, which is large and composed of two or three scallops while that of *R.*

lacustrata is simple, smaller, and subacute); the discal dot is often surrounded by a well-marked black ring (sometimes the band is so wide that no ring is formed); the wing beyond the median band is dusky cinereous, where it is white in *R. lacustrata*: there are two parallel, dusky, scalloped lines, sometimes nearly obsolete, and represented by two rows of venular black marks; a distinct, white, marginal, scalloped line, ending on the costa in front of a squarish black spot. The hind wings are more dusky and clouded than in *R. lacustrata*, with usually less distinct lines: there are three scalloped lines just beyond the small discal dot, and a double, diffused, marginal band; beneath, the markings are much as in *R. lacustrata*, but the submarginal white line on the fore wings is wanting.

Length of body, ♂, 0.45, ♀, 0.40; of fore wing, ♂, 0.52, ♀, 0.52; expanse of wings, 1.10 inches.

Nahant, Mass. (Moering); Cambridge, Mass., July 3-21 (Morrison); Brookline, Mass., June 1, August 18 (Shurtleff); Albany and Sharon, N. Y. (Liutner); New Jersey (Sachs); Easton, Pa. (Stultz); Philadelphia, Pa. (Amer. Ent. Soc.); West Virginia, April 8 (Mead); "Canada, New York, Pennsylvania" (Guenee); "Saint Martin's Falls, Hudson's Bay, Canada, Nova Scotia, and New York" (Walker).

This common species differs from *R. lacustrata*, with which it is liable to be confounded, in the darker-ashen wings, the three-toothed point in the median band, in the wing being dusky or flesh-colored beyond this band, and in the darker hind wings. It is very near the European *R. galiata* (W. V.), and may prove to be identical with it.

RHEUMAPTERA LACUSTRATA Packard. Plate 8, fig. 74.

Melanippe lacustrata Guen., Phal., ii, 395, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1296, 1862.

6 ♂ and 6 ♀.—Ground-color white; body dull-ash. Fore wings with two curved, wavy lines at base, with an acute angle on the discal space; between the two lines, and within them, the wings are tinged with dull reddish-brown; beyond the two basal lines is a clear white band containing two or three dusky lines; the median band is heavy, black, more conspicuous than usual; it varies in width, contracting more or less just before reaching the inner edge of the wing; the angle of the outer edge on the median vein is simple, unidentate, obtuse, sometimes subacute; above the angle the band goes straight to the costa, without any sinus; the band is limited by

white; the base of the fore wings dark, bound beyond by a white line, which is succeeded by a broader dark band; between this and the median dark band is a white band varying in width; this band traversed by a dusky line; the median band and its discal dot is much as in *lacustrata*, but there is apt to be a decided sinus above the point on the median band; beyond this band is a broad, clear, white band, very well marked, and common to both wings; it is this clear, conspicuous band which separates this species from *lacustrata*; this band contains a dusky line; the margin of the wing is dark, traversed by the usual scalloped line. Hind wings dusky on the basal half, with a distinct discal dot; the broad white band is situated half-way between the discal dot and the edge of the wing, which is dusky, and traversed by a wavy white line.

Length of body, ♂, 0.40, ♀, 0.36; of fore wing, ♂, 0.50, ♀, 0.50; expanse of wings, 1.05 inches.

Springfield, Mass., June 12 (Dimmock); Cambridge, Mass. (Harris Coll.); Brewster's, N. Y. (Grote); Ithaca, N. Y. (Smith.); Washington, D. C. (Dodge); Victoria, Vancouver Island, July (Crotch); Bear Creek, June 29 (Lieutenant Carpenter, Hayden's Survey).

There is no difference between eastern and Pacific-coast examples, nor can I see any difference in size or markings from European examples received from Professor Zeller.

The range of this species in the Old World is, according to Staudinger, as follows: Northern Germany; Northern England (including Scotland); Belgium; Southern France; Switzerland; Galicia; Finland; St. Petersburg; Southern and Western Russia; Amur.

Larva.—"The caterpillar is stout, rather attenuated at both ends, and rests with the head tucked in, the anterior part of the body, when disturbed, being curled in, or curved in the manner of the Ionic volute; the head is brown, beautifully dotted and marked with black; the body is smoky-brown, delicately mottled and varied; the back may be said to have seven smoke-colored stripes, alternating with paler stripes; the medio-dorsal stripe is not perceptible on either the second or thirteenth segments, but is distinct and uninterrupted on the third, fourth, fifth, sixth, seventh, and eighth segments; it is suddenly dilated anteriorly, and more gradually posteriorly, and is extremely attenuated and scarcely perceptible on the remaining segments; on each of the interstices between the segments, commencing between the fourth and fifth, is a short, transverse, reddish band, terminated at each

extremity by a longitudinal black spot; the remaining smoke-colored stripes, three in number, on each side of the median stripe, are scarcely susceptible of verbal definition; each segment of the belly after the fourth has a cluster of black dots, which are not present in any other British species of the genus; but Mr. Hellins informs me that markings of the same color and character occur in *Cidaria pectata*. It feeds on the common chickweed (*Alsine media*) and is full-fed at the beginning of August. It spins its cocoon on or just under the surface of the earth, and remains in the chrysalis state all the winter. In captivity, it is sometimes double-brooded, but not in a state of nature."—Newman's British Moths, 159.

RHED MAPTERA LUGUBRATA Packard. Plate 9, fig. 8

"*Geometra luctuosa* Denis and Schiff., Wien Verz., 316, n. Cat.

"*Geometra transversata* Thunberg, Mus. Nat., 75, fig. 8, 1788."

"*Geometra luctuosa* Hübner, Bir., ii, 1, 3, T., 1792; Schm. Eur., 253, 1796."

Cidaria luctuosa Treits., Schm. Eur., vi (n.), 214, 1828.

Melanippe luctuosa Dup., Lep. France, vii (x), 286, pl. 199, fig. 4, 1839.

Boisd., Gen. Ind., 216, 1840.

Larentia luctuosa H. Sch., Schm. Eur., iii, 156, 1847.

Melanippe luctuosa Guen., Phala., ii, 392, 1857.

Cidaria obducta Moeschl., Monats., Wien, 374, tab. 19, fig. 3, 1869.

Melanippe luctuosa Walk., List Lep. Het. Br. Mus., xxv, 1284, 1862.

Melanippe luctuosa Walk., Lis. Lep. Het. Br. Mus., xxv, 1295, 1862.

Cidaria lugubrata Standinger, Cat., 2d ed., 189, 1871.

Melanippe Kodiakata Pack., Proc. Ent. Soc. Nat. Hist., xvi, 23, pl. 1, fig. 7, 1874.

3 ♂ and 2 ♀.—Body and wings blackish; body whitish beneath. Fore wings blackish on basal half, with grayish scales, and a zigzag line just before the black discal mark; just beyond the discal dot, a broad whitish band, wider on the costal than on the inner edge, diffuse externally; on the inside scalloped, and slightly excavated on the median vein; beyond this band are two obscure, pale, wavy lines, the outer ending on the costa, close to the apex; edge of the wing with a narrower black line; fringe paler than in the other species, checkered with black. Hind wings with a broad white band, obscure on the hind edge, and angulated outward just below the middle of the wing; beneath, both wings white, with wide black borders, but white at base, with a basal blackish shade; an outer blackish band enclosing the darker, large, distinct, oval, discal dot, and below this angulated outward; hind wings white, with a broad black border, and a narrow dark line just beyond the distinct black discal dot, which is much smaller than that on the primaries. Legs blackish, ringed with white.

Length of body, ♂, 0.37–0.45, ♀, 0.35; of fore wing, ♂, 0.52–0.56, ♀, 0.48; expanse of wings, 1.00–1.20 inches.

Hopedale, Labrador (Packard); Quebec, Canada (Bélanger); Brunswick, Me. (Packard); "Lake Athabasca" (Kennicott, Grote); "St. Martin's Falls, Hudson's River, Terr." (Walker); Turkey Creek Junction, Colorado, June 27 (Mead); Kenay, Alaska (Behrings); Kodiak Island, Alaska (Edwards).

This easily recognizable species may be known by the uniformly black wings, with the broad white band in the middle of both wings; the band varying much in width, and sometimes entirely wanting on the hinder pair.

Compared with an Alaskan example, a Colorado one is larger, with the white band on the hind wings three times as wide, thus leaving a narrow, dark margin, and a faint, dusky shade at the base of the wing. I had regarded the Alaskan and Maine specimens as quite distinct, and the latter as distinct from the Labrador var. *obductata*; but a Pacific-coast specimen, received from Mr. James Behrings, labeled "Kenay" (near Kodiak, Alaska), is intermediate between vars. *kodiakata* and *obductata*. The Pacific-coast individual has the white band on the fore wings much bent, as in Maine specimens, and the hind wings almost black, as in var. *concordata*; the white line being almost obsolete. The Labrador individuals are more stunted than the Maine ones, but both have black hind wings; while the Pacific-coast and Colorado examples are much whiter, with broader white bands. The Alaskan moth closely resembles Duponchel's figure. Thus the Pacific and Colorado forms resemble the European much more than the New England and Labrador examples. It inhabits Central Europe, Lapland, the Ural and Altai Mountains, and Amur. It is reported by Grote as having been collected by Kennicott along the route from the Mackenzie River to Lake Athabasca.

RHEUMATTERA TRISTATA Packard. Plate 9, fig. 9.

Phalana-Geometra tristata Linn., Syst. Nat., x, 526, 1758.

"Borkh., Schm. Eur., v, 439, 1794."

Eulype tristata Hübner, Verz., 328, 1818.

Cidaria tristata Treits., Schm. Eur., vi (ii), 219, 1828.

Melanippe tristata Dup. ("in part"), Lep. France, viii (v), 291, pl. 190, fig. 5, 1830.

Harpalque tristata Steph., Ill., iii, 223, 1831.

Melanippe tristaria Boisd., Gen. Ind., 216, 1840.

Larentia tristaria H. Sch., Schm. Eur., iii, 156, 1847.

Melanthia tristata Steph., Cat. Br. Ins., 213, 1830.

Melanippe tristata Guen. ("in part"), Phal., ii, 390, 1857.

Walk., Last Lep. Det. Br. Mus., xxv, 1283, 1862.

3 ♀ —A small black species. Fore wings black, with a wavy, curved,

basal line, bent outward on the median vein; on the inner third of the wing is a double (sometimes single) white line, wavy, with a distinct angle on the median vein; a dark, indistinct, discal dot; about half-way between the discal dot and the outer edge of the wing is a much broader white band than the others, traversed in the middle by a black wavy line (sometimes consisting of a row of dots); the band is irregular, with a prominent angle in the first median space; half-way between this band and the edge of the wing is a scalloped white line, usually represented by a row of white dots. Hind wings marked just as in the fore wings; fringe black, checkered with white; beneath, the same as above, with the bands and spots wider, so that there is a greater white surface than above.

Length of body, ♀, 0.35; of fore wing, ♀, 0.45; expanse of wings, 0.90 inch.

This is allied to *R. hastata*, but differs in its smaller size, and in the hinder wings being marked like the anterior pair. Three specimens occurred at Beaver Creek, near Fair Play, South Park, at the borders of the surrounding mountains, elevation 9,000 feet, or a little over; and at Turkey Creek Junction, Colo., June 16–25 (T. L. Mead). These examples do not differ from some received from Europe through Prof. P. C. Zeller. This is its first occurrence in the United States. I am informed by Mr. H. Stricker that he has a specimen from Labrador which does not differ from European examples. It occurs in Central and Northern Europe and Turkey, and is reported by Standinger, with a query, from the Ural Mountains and Amur.

Larva.—"The caterpillar is cylindrical, slightly attenuated in front, and rests in nearly a straight posture; but, when disturbed, tucks in its head, and the anterior part of the body is then slightly involute. The head is brown, dotted with black; the body brown, with a dark, nearly black, narrow, median stripe; on each side of this are two white dots on each segment; and on each side of the body are two narrow, pale, slightly undulating stripes, the lower of which is immediately above the spiracles; these two stripes are most delicately margined with black. This caterpillar is extremely constant in color. It feeds on the hedge-bed-straw, and is full-fed at the beginning of August. It spins a slight cocoon on the surface of the earth, and remains in the chrysalis state throughout the winter."—Newman's British Moths, 157.

This species is said to be double-brooded in Europe.

RHEUMAPTERA HASTATA Hübner. Plate 9, figs. 10, 11.

- Phalonia-Geometra hastata* Linn., Syst. Nat., 527, 1758.
 "Borkh., Schm. Eur., 210, 1794."
 "Geometra hastata Hübner, Schm. Eur., tab. 49, fig. 256, 1796."
Rheumaptera hastata Hübner, Tentamen, 1-06-10.
Eulypis hastata Hübner, Verz., 328, 1-18.
Laurentia hastata Treits., Schm. Eur., vi (cir.), 207, 1-28.
Xeroc hastata Steph., Nomencl. Br. Ins., 44, 1-29.
Melanippe hastata Dup., Lep. France, viii (x), 282, pl. 190, fig. 3, 1830.
 Steph., Ill., iii, 248, 1-31.
Melanippe hastaria Boisd., Gen. Ind., 215, 1840.
Laurentia hastaria H.-Sch., Schm. Eur., iii, 156, 1-47.
Melanippe hastata Steph., Cat. Br. Lep., 212, 1-59.
Melanippe gothicata Guen., Phal., ii, 388, 1-57.
Melanippe hastata Guen., Phal., ii, 389, 1-57.
Cidaria gothicata Moeschl., Monats. Wien, 374, tab. 10, figs. 4, 5, 1860.
Melanippe hastata Walk., List Lep. Het. Br. Mus., xxv, 1282, 1-62.
Melanippe gothicata Walk., List Lep. Het. Br. Mus., xxv, 1293, 1-62.

3 ♂ and 10 ♀.—This very characteristic and widely-distributed species, the largest of the genus, is deep-black, including the body and wings, with slender white lines edging the abdominal segments. The fore wings are black, with two remote, wavy, curved, basal, white lines often wanting; sometimes a third white line is present, situated half-way between the second line and the outer white band; it runs next to the obscure, black, discal dot; the extradiscal white band is sinuous, bent outward in the middle of the wing, and contains a median row of venular black dots, never united (so far as yet known) into a continuous line as in *R. tristata*; sometimes the black dots are wanting; the point of the median angle is sometimes broken off and isolated from the band as a rhomboidal white spot; the submarginal white line is usually more or less obsolete. Hind wings either wholly black or with traces of a double median line. Fringe black, more or less distinctly checkered with white. Beneath, with the same markings as above, but more diffuse.

Some of the Labrador, Alaskan, and Rocky Mountain specimens are much whiter than usual (as in fig. 11); the lines and bands being wider, more diffuse, and running into each other; the submarginal band is heavily scalloped; and on the hind wings are two basal white lines. On the under side, the white bands and spots are still larger.

Length of body, ♂, 0.45, ♀, 0.45; of fore wing, ♂, 0.65, ♀, 0.65-0.70; expanse of wings, 1.10 inches.

Okak, Northern Labrador, and Caribou Island, Southern Labrador, July 14, common, flying in the sunny valleys (Packard); London, Canada (Saunders).

ders): Brunswick, Me., July, abundant during certain years (Packard); White Mountains, New Hampshire, early in August (Packard); sides of Mount Washington, July (Morrison); Essex County, Vermont, July (Cassino); Brookline, Mass., June 25—July 11 (Shurtleff); Cambridge, Mass., July 1 (Harris Coll.); Springfield, Mass., June 18 (Dimmock); Buffalo, N. Y. (Grote); Oneida, N. Y. (Hawley); New Jersey (Sachs); Michigan (Mus. Peab. Acad. Sc.); Kenosha House, Colorado, June 30 (Mead); Alaska, common (Dall); "Vancouver's Island; St. Martin's Falls, Hudson's Bay; Canada, Nova Scotia; East Florida" (Walker).

This fine moth is the largest species of the genus, and may be distinguished by its sable hues and the conspicuous white lines and bands. Our American examples do not differ specifically from European ones; and I am inclined to regard *R. hastulata* Hübn. and *thulearia* Staud. (received from Lapland through Dr. Staudinger) as varieties of this variable species.

The Old World localities given by Staudinger are: Central and Northern Europe (excluding Galicia and the polar regions); Piedmont; Ural and Altai Mountains; and Amur.

Larva.—"The head of the caterpillar is of moderate size; the body, when at rest, almost straight; the head not tucked in, and hence the anterior part of the body not involute; the second segment is covered with a shining plate; the other segments regularly and transversely wrinkled, and of a texture like leather; the tenth segment is rather the largest, and from that the larva tapers slightly to both extremities; the color of the head is black and shining; the body is generally black, but sometimes rich black-brown; on each side is a continuous series of minute black dots, which form a slender lateral stripe along all the segments except the second and thirteenth; this stripe is above the spiracles; the spiracles are black, and each is enclosed in a white spot, and below each white spot is a crescentic white marking, the convexity of which is toward the belly, the cusps toward the back; above the slender lateral stripe already described, there is sometimes an interrupted subdorsal stripe. All these markings vary occasionally from white to brick-dust red. It feeds on birch (*Betula alba*) and sweet-gale (*Myrica gale*). The economy, habit, structure, and distribution of color in the caterpillar of *Melanippe hastata* are entirely different from those of any other of the genus *Melanippe*. It spins together the leaves of its food-plant, and feeds from the inside of the chamber thus formed; sometimes eating through the substance of the leaf,

at others eating only the upper surface. It is full-fed toward the end of August, and soon afterward becomes a chrysalis, in which state it passes the winter."—Newman's British Moths, 157.

Melanippe reciprocata Walk. is *Odezia alborittata*, as I learned from an examination of the type in the British Museum.

Desiderata.

Melanthia condensata Walk., List Lep. Het. Br. Mus., xxiv, 1273, 1862.—New York.

Melanthia gratulata Walk., List Lep. Het. Br. Mus., xxiv, 1273, 1862.—Vancouver's Island.

Melanippe propria Walk., List Lep. Het. Br. Mus., xxv, 1293, 1862.—Canada.

ANTICLEA Stephens. Plate 1, fig. 11.

Anticlea Hübn. (in part), Verz., 333, 1815.

Cidaria Treits. (in part), Schm. Eur., vi (in.), 140, 1828.

Harpalyce Steph. (in part), Nomencl. Br. Ins., 41, 1829.

Cidaria Dup. (in part), Lep. France, xiii (x), 298, 1830.

Leucoproctus Steph. (in part), Ill., iii, 233, 1831.

Anticlea Steph., Ill., iii, 236, 1831.

Cidaria Boisd. (in part), Gen. Ind., 212, 1840.

Leontia H. Sch. (in part), Schm. Eur., iii, 141, 1847.

Leucoproctus and *Anticlea* Steph., Cat. Br. Lep., 193, 1850.

Anticlea Guen., Phal., ii, 101, 1857.

Cidaria Staudinger, Cat., 78, 1861; 2d ed., 1871.

Anticlea Walk., List Lep. Het. Br. Mus., xxv, 1299, 1862.

Head considerably broader between the eyes than in *Rheumaptera*, and more so than in *Ochyria*. The scales on the vertex are raised in a projecting, broad, transverse crest. Male antennæ usually densely ciliated. Palpi short, hardly passing beyond the front; second joint very broad; third, minute, conical, concealed by the projecting hairs of the second joint. Fore wings broader than usual; otherwise the form of the wing is much as in *Rheumaptera*. The hind wings differ in being a little more produced than in *Rheumaptera*. In the venation, the genus differs from both *Ochyria* and *Rheumaptera* in the much shorter first subcostal; the first three subcostal venules being of the same length, where they are, in the two above-named genera, unequal, the first being nearly twice as long as the second; two unequal subcostal cells; the discal venules run directly at right angles to the costal edge, the posterior discal venule not being oblique as usual; in this

respect, they are as in *Eupithecia*. Hind legs rather long; tarsi nearly as long as the tibiae. Abdomen, in the male, much thicker and less tufted than usual. Coloration: gray wood-color, with prominent dark lines enclosing a pale median band: the outer with large teeth in the subcostal and again in the median region of the wing: a rather prominent, scalloped, dark line on the hind wings.

Differs from the neighboring genera *Rheumaptera* and *Ochyria* in the broader head, short palpi, the tufted vertex, the broader fore wings, and more produced hind wings, as well as the stouter abdomen and the venation. It is, in the general shape of the wings, closely similar to *Rheumaptera*, but, in coloration, is more likely to be confounded with *Ochyria*. Guenée says that in some European species the antennae are filiform.

ANTICLEA VASILATA Guenée. Plate 9, fig. 12

Anticlea vasilata Guen., Phal., ii, 407, 1857.

Walk., List Lep. Hel. Br. Mus., xxx, 1303, 1862.

1 ♂ and 2 ♀.—Of a dark-brown, with dark olivaceous hue, and blackish-brown bands and lines on the fore wings. Head with a blackish-brown transverse line below the insertion of the antennae, and on the anterior edge of the front blackish-brown. Male antennae single, very finely ciliated. Palpi short; terminal joint short, projecting but slightly beyond the front of the head, tipped with blackish-brown. Fore wings crossed by three well-marked blackish bands, whitish, the basal conspicuous, heavy, blackish externally, with a light inner line, and a mesial still fainter line; the band is slightly concave externally, on the outer edge nearly straight and scalloped, there being two distinct scallops in front of and behind the median vein; two faint brown lines between the basal and median bands, the space being faintly tinged with purplish; the median band very distinct, blackish-brown, the inner side heavier, blacker than the outer, with a faint, brown, median line; on the inner side, the band is suddenly curved inward between the median and submedian veins; externally, the band curves outward just above the median vein, otherwise it is straight; in the middle of the wing, a clear light space, nearly twice the width of the median band; sometimes the space is almost white; it encloses a distinct discal dot; beyond the clear median space is a light-brown space, tinged with dark olive-green, of the same width as the median space, its inner edge dentate and scalloped, being parallel with

the outer edge of the band, which is sharply defined by a black line edged externally with white; this line is situated about half-way between the outer edge of the pale band and the outer edge of the wing; just below the costal edge, it sends off two unequal, subacute teeth, the lines twice as large as the upper, and bordered heavily with black internally; the line curves in as it crosses the discal space; in the first and second median spaces is a prominent, well-rounded scallop, below which the line runs straight to the inner edge, being three times scalloped in its course; beyond this line, a broad, dull, purplish shade, filling in the scallops; a submarginal, interrupted, white thread; a conspicuous, dark, oblique, apical streak; the usual dark marginal line; fringe brown, tipped with white. Hind wings washed with brown, darker beyond the single, extramedial, curved line, which has two scallops, one in each of the two first median spaces. Beneath, the wings are less clear than usual, being finely dusted with brown, clearer on the basal half, and with two parallel lines, the outer line consisting of venular dots connected by a faint line; a subbasal, black, costal patch. Legs dark, ringed with whitish. Abdomen brown, with dark transverse lines above, especially marked toward the base.

Length of body, ♂, 0.48, ♀, 0.45; of fore wings, ♂, 0.60, ♀, 0.63; expanse of wings, 1.25 inches.

London, Canada (Saunders); Brunswick, Me. (Packard); West Roxbury, Mass. (Sanborn); Brookline, Mass. (H. K. Morrison); West Farms, N. Y. (Angus); Brooklyn, N. Y. (Graef); "Canada" (Guenee); West Canada; St. Martin's Falls, Albany River, Hudson's Bay (Walker).

This fine moth may be known by the conspicuous, white, mesial band, and, in rubbed specimens, by the three blackish bands on the fore wings, and by its olivaceous hue; also, by the dentate and scalloped, very distinct, outer line, situated in the outer fourth of the wing; by the clear hind wings, with a single line, and the distinct, apical, oblique line on the fore wings.

I am indebted to Mr. H. K. Morrison for the identification of this species.

PHIBALAPTERYX Stephens. Plate 1, fig. 12.

Catocalpa, *Dactylus*, and *Orthotoma* Hüb., Verz., 330, 331, 1818.

Leubalia Treuss., in part; Schin., Ent., vi (ii), 5, 1828.

Phibalapteryx Steph., Nomencl. Brit. Ins., 11, 1829; "Cat.", 138, 1829.

Lecanobia Dup., in part; Lep. France, vii (v), 558, 1830.

Phibalapteryx Steph., Ill., iii, 255, 1831.

Curtis, Brit. Ent., 623, 1836.

Evercia Boisd. (in part), Gen. Insl., 294, 1849.

H. Sch., Schin. Ent., iii, 141, 1847.

Phibalapteryx Steph., Cat. Br. Lep., 297, 1859.

Guen., Phil., ii, 141, 1857.

Cidaria Standinger, Cat., 182, 1861.

Phibalapteryx Walk., List Lep. Het. Br. Mus., xxx, 1332, 1862.

Head much as in *Antichea*, with no prominent vertical tuft, however, but a well-marked interpupal tuft. Palpi broad and stout, but short, extending but little beyond the front; the third joint minute, concealed. Antennæ of male flattened, finely ciliated. Fore wings large, broader than usual; apex well produced, subacute; outer edge slightly angular in the middle. Hind wings small, distinctly scalloped, of the same form as in *Ochyria*, but with the apex more obtuse; the first subcostal venule is much longer than the second, though shorter than in *Ochyria* and *Rheumaptera*; second and third nearer together than usual; two subequal subcostal cells; second posterior discal venule bent, much as in *Ochyria*. Hind legs with the tarsi nearly as long as the tibiae. Abdomen short and thick. Coloration: either much as in *Ochyria* or both wings are crossed by numerous wavy lines, much as in some species of *Philereme*.

Our common *P. intestinata* is readily recognized by the large fore wings and the small scalloped hind wings, as well as the numerous wavy lines. *P. latirupta*, which is like the European *P. polygrammata*, is marked much as in *Ochyria designata*, and has longer palpi than in *P. intestinata*, and is evidently a connecting link between the two genera.

Larva.—“Caterpillars very long, filiform, a little attenuated in front, smooth; head lenticular, flattened, having much-developed maxillary palpi; living exposed on woody plants, very lively, and rolling themselves into a helix at the least touch. Chrysalides subterranean.”—Gueneé.

Synopsis of the Species.

Much like *Ochyria designata*, except that the hind wings are scalloped, *P. latirupta*.
Much larger and darker, with more deeply-scalloped hind wings and longer fore wings *P. intestinata*.

PHIBALAPTERYX LATIRUPTA Walker. Plate 8, figs. 64, 65.

Phibalapteryx latirupta Walk.!!! (vide Gueneé, List Lep. Het. Br. Mus., xxxv, Suppl., pt. 5, 1684, 1866.

Cidaria Uscinata Zeller!!! Verh. Bot. Zool. Ges. Wien, xxiii, 295, 1873.

8 ♂ and 8 ♀.—Antennæ flattened and ciliated finely on the edges; joints two-thirds as long as broad. Palpi shorter and thicker than usual, blackish, a little paler at tip above. Fore wings pale cinereous; on outer half and at base

faintly roseate; a basal, double-curved, black line, edged within with roseate; beyond, a middle, black-brown, double line; the outer line very linear, enclosing a roseate line, a little dilated inward on the costa; discal dot round, black, in a clear band of pale-ashen; the extradiscal band, consisting of a sinuate black line or lines, shading diffusely, especially at its lower end; opposite the discal dot it nearly disappears, sending a zigzag faint line straight to the inner edge; beyond is a row of black points, still beyond which is a submarginal, zigzag, white line, most angulated near the apex; a submarginal row of black lunules toward the apex, becoming linear in the middle and at the inner angle of the wing; fringe pale-ashen, with a roseate tint, paler on the outer half. Hind wings pale-ashen, with a slight roseate fringe, with numerous dark lines on the hind edge; an outer row of dark dots, and a submarginal, zigzag, white line; edge of wing well scalloped; fringe long, with a small, rather obscure, discal dot; beneath, pale-ashen, with thick, broad scales, luteous at base, scarcely arranged in lines, and thicker at the base of the wing. Body and legs beneath pale.

Length of body, 0.36; of fore wing, 0.46; expanse of wings, 0.75–0.95 inch.

New York (Angus, Mus. Peab. Acad. Sc.); Wisconsin (Mus. Peab. Acad. Sc.); Central Missouri, at light in June (Riley); Waco, Tex., March 21–29, September 21–29.

It is evident from these dates that it is double-brooded in Texas.

A variety (plate 8, fig. 65) received from Texas (Belfrage), and taken March 12, is rather large, expanding 0.95 inch, with the fore wings more acute than usual. The general tint is as usual; but the basal line is darker and heavier, the middle line very broad and black, twice as wide as usual, and the outer side of the median band is heavier and darker than usual.

I confess that at first I regarded this species as an *Ochyria*, closely allied to *O. designata*. It differs in the large number of lines in the middle of the fore wings and the many-lineated scalloped hind wings. It is closely allied to the European *P. polygrammata*.

PHIBALAPTERYX INTESTINATA Guenée. Plate 9, fig. 13.

Phibalapteryx intestinata Guenée, l. Phal., ii, 132, 1855.

Walk., l. List Lep. Het. Br. Mus., xxv, 1337, 1862.

2 ♂ and 4 ♀.—A large species, with the fore wings large, the costa quite full toward the apex, and the outer edge very oblique. It is dull ash-

colored, with about twelve black lines on the fore wings, and about the same number on the hind wings. The lines are black, very oblique, becoming scalloped toward the outer edge, beyond the distinct discal dot; the third line beyond the discal dot is double, with long, regular scallops; the two next lines are near together, and close to the submarginal, zigzag, white line; opposite each point of the white scallop is a marginal black dot, adjacent to the marginal, black, interrupted line; fringe pale, checkered with brown. Hind wings marked like the anterior pair, with the edge well scalloped; beneath, the wings are paler and clearer, with the black discal dots larger and very distinct, with faint traces of the extradiscal lines.

Length of body, ♂, 0.45, ♀, 0.50; of fore wing, ♂, 0.65, ♀, 0.70; expanse of wings, 1.40-1.45 inches.

Brunswick, Me. (Packard); Portland, Me. (Morse); Salem, Mass., August 24 (Putnam); Brookline, Mass., August 26 (Shurtleff); Boston, Mass., June 10 (Minot); Cambridge, Mass. (Harris Coll.); Natick, Mass. (Stratton); Amherst, Mass. (Goodell); West Farms, N. Y. (Angus); "Canada" (Guenée); "Canada, Florida, Georgia" (Walker); Montreal, Canada (Lyman).

HYDRIA Hübner.

Hydria Hübner, Tentamen, 1806-10.

Calocalpe Hübner, Verz., 330, 1818.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 52, 1828.

Larentia Dup. (in part), Lep. France, xiii (v), 358, 1839.

Eucosmia Steph., Ill., iii, 265, 1831.

Larentia Boisdu. (in part), 204, 1840.

H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Calocalpe Steph., Cat. Br. Lep., 210, 1850.

Scotosia Guen. (in part), Phal., ii, 449, 1855.

Eucosmia Standinger, Cat., 78, 1861.

Scotosia Walk. (in part), List Lep. Het. Br. Mus., xxv, 1342, 1862.

The head is as in *Philereus*; but the palpi are much shorter, passing but little beyond the head, and with the third joint sharp, minute, partly concealed by the hairs of the second joint. Antennæ simple, not ciliated. Fore wings large and broad, but not so much larger than the hind wings as in *Philereus*, and not so foliate; apex obtuse, outer edge slightly less oblique than in *Philereus*, and not scalloped. Hind wings much longer and larger, with the apex not produced, much more rounded than usual; outer edge full and rounded, slightly excavated below the apex, but not scalloped; inner edge with an ear and prominent tuft, much as in *Philereus*. Venation: as in *Philereus*, but the second subcostal venule is longer and more parallel to the

costa. Hind legs rather thick; tarsi as long as the tibiae. Abdomen very thick; extremity large and conical, not tufted as in *Philereme*. Coloration: both wings crossed by distinct, uniform, scalloped, alternating white and dark lines.

This genus is recognizable from the distinct, zigzag, white and dark stripes, the long hind wings, beautifully tufted, but not scalloped, as well as by the short palpi and the want of an infra-anal double tuft.

HYDRIA UNDULATA Hübner. Plate 9, fig. 17.

Hydria undulata Hübner, Tentamen, 1896-10.

Calocalpe undulata Hübner, Verz., 330, 1-18.

Acidalia undulata Treitsch., Schm. Eur., vi (ii), 53, 1828.

Larentia undulata Dup., Lep. France, viii (v), 377, 1830.

Eucosmia undulata Steph., Ill., iii, 265, 1831.

Larentia undulata Boisdu., Gen. Ind., 205, 1840.

H. Sch., Schm. Eur., 111, 1-47.

Calocalpe undulata Steph., Cat. Br. Lep., 210, 1850.

Scotosia undulata Guen., Phal., ii, 449, 1857.

Eucosmia undulata Standinger, Cat., 78, 1861.

Scotosia undulata Walk., List Lep. Het. Br. Mus., xxv, 1316, 1862.

5 ♂ and 5 ♀.—Body and wings pale fawn-brown. Fore wings with about twelve well-marked, white, scalloped, parallel, approximate lines, becoming more deeply scalloped beyond the discal spot, which is large, black, with one of the dark lines running through it; the brown lines alternating with the white ones become blackish toward the base of the wing; the submarginal white line is more zigzag than the others, and situated half-way between the edge of the wing and the next white line. On the hind wings are about six light lines, becoming whitish toward the outer edge of the wing, as well as more zigzag; the lines are heavier than on the fore wings; beneath, the wings are clearer, with the lines more or less obsolete, and the discal dots large and distinct.

Length of body, ♂, 0.50, ♀, 0.50; of fore wing, ♂, 0.75, ♀, 0.75; expanse of wings, 1.55 inches.

Brunswick, Me., common about houses (Packard); Essex County, Vermont, July (Cassino); White Mountains, August 13 (Shurtleff); Cambridge, Mass., June 24, October 10 (Harris Coll.); Brookline, Mass., August 6 (Shurtleff); West Roxbury, Mass. (Sanborn); Amherst, Mass. (Goodell); West Farms, N. Y. (Augus); Easton, Pa. (Stultz); New Jersey (Sachs); Black Hawk, Colo., elevation about 8,000 feet, July 2, several taken in a gulch above the town (Packard, Hayden's Survey); Victoria, Vancouver Island (Crotch).

This common and widely-distributed species may be known by its large size and numerous, alternating, white and brown, scalloped lines on a clear fawn-brown ground. The circumstances under which this species occurred in Colorado show plainly that it is indigenous in America.

The west-coast and Colorado examples are a little larger (fore wing, ♀, 0.80) than eastern examples (fore wing, ♀, 0.70).

Larva.—“Mr. Beauchamp has favored me with the following life history of this species: ‘I took a female in 1861. She laid me some small, oval, whitish eggs on the under side of a sallow-leaf, generally in the hollow by the side of the midrib or some other rib, often two or more on a leaf, but never adjoining each other. I transferred them to a young tree growing in a pot. As soon as hatched, the caterpillars spun a web resembling that of the *Yponomeutida*, and sometimes, like them, several together. When a little older, they bent and fastened leaves together, and ate through the walls of their dwelling until they left only a skeleton, when they went on to another place to behave in a similar manner. They were very sluggish, not taking the trouble to push their tails outside, so that, when they had eaten the walls of their tent, the lower part formed a bag full of their excrement. They usually lay curled up in their tent, and all mine continued to dwell under cover until they went down. I think I never saw them outside, except when they were removing, and once when they had eaten their plant down to the stump. Then they crawled about uneasily until fresh food was introduced. When full-grown, they were scarcely an inch long, and reminded me somewhat of the caterpillars of *Eupithecia venosata* in their general appearance. I proceed to give a description of them:—Short and stumpy, with a few very short hairs; head small, shining-brown, the two upper lobes round and conspicuous; dorsal line brown, bordered on the upper side by a slender, broken, whitish line (perhaps this is the true subdorsal); spiracular line broad, dirty-white, puckered; the ground-color above the spiracular line varies from pale flesh-color to dark-brown, the belly from pale-gray to dark-gray: in the dark specimens, the dorsal line is scarcely perceptible, but the subdorsal (?) is perceptibly darker: on the upper side of each of the anal claspers there is a large blackish spot, in addition to which light specimens have a blackish spot on the centre-piece of the anal segment. The chrysalis is in rather a slight earthy cocoon. I kept mine in a fireless attic’”—Newman’s British Moths, 179.

PHILEREME Hübner. Plate 1, fig. 13.

Philereme Hübner, Verz., 330, 1818.

Idadalia Treits. (in part), Schin. Eur., vi (ii), 52, 1828.

Scotasia Steph., Nomencl. Br. Ins., 41, 1829; "Cat. Br. Lep., ii, 439, 1829."

Larentia Dup. (in part), Lep. France, vii (v), 358, 1830.

Scotasia Steph., Ill., iii, 259, 1831.

Larentia Boisd. (in part), Gen. Ind., 201, 1840.

H. Sch., Schin. Eur., iii, 141, 1847.

Scotasia Guen. (in part), Phal., ii, 449, 1857.

Standinger, Cat., 78, 1861.

Walk. (in part), List Lep. Het. Br. Mus., xxv, 1312, 1862.

Head rather narrow between the eyes, with an interpalpal tuft. Palpi rather long and slender, projecting well in front of the head; third joint free from the second. Male antennae scarcely ciliated. Fore wings subfalcate, with the apex much produced and very acute; outer edge very oblique, slightly scalloped. Hind wings short, much produced toward the apex, which is much more acute than in *Hydria* or *Triphosa*; outer edge deeply scalloped, more so than usual; males with an expansion of the inner edge, and a long, narrow brush of hairs below; the first subcostal veinule is long, the second and third short, their origins remote from that of the first; two subcostal cells. Hind legs, with the tarsi, as long as the tibiae. Male abdomen large and stout, thick, with a large, infra-anal, broad, long tuft appressed to the side before the thick conical extremity. Coloration: dark, with numerous indistinct common lines, and an extradiscal heavier line common to both wings.

This fine genus differs from *Hydria* or *Triphosa* in the acute fore wings and hind wings. From *Hydria* it differs also in the longer palpi, the much smaller hind wings, and in both pairs being scalloped. The ear-like projection on the inner edge of the hind wing is much as in that genus. The species differ in the degree of acuteness of the fore wings and of the scalloping. In *P. albosignata*, the outer edge of the hind wings is bent a little, where it is not so in *P. mcadiata*.

Synopsis of the Species.

The smallest species; dark, with a distinct, whitish, extradiscal, scalloped line; hind wings but slightly scalloped. *P. albosignata*.
 Very dark; a little larger than *albosignata*; hind wings more scalloped. *P. californiata*.
 A distinct, dark, extradiscal line; hind wings with five large scallops. *P. mcadiata*.

PHILEREME ALBOSIGNATA Packard. Plate 9, fig. 14.

Phibolapteryx intestinalis Walk.!!! (in part), List Lep. Het. Br. Mus., xxv, 1337, 1862.

Scotasia albosignata Pack., Fifth Rep. Peab. Acad. Sci., 61, 1873.

4 ♂ and 2 ♀.—In this species, the fore wings are entire, the hinder pair

but slightly scalloped, being rather finely dentate. Compared with *P. undulata*, the wings are much smaller, the body rather larger, and the hind wings more deeply and acutely dentate. Body and wings dark wood-brown, the wings covered by fine, dark, irregularly-scalloped lines, forming dark venular points. Fore wings with an indistinct, basal, whitish line, angulated on the costa; a similar one beyond, waved between the venules; and an outer white, irregular, scalloped line, there being two grand scallops projecting outward in the first and second median cells; a submarginal, obscure, half-effaced, zigzag line; three rows of white venular points (often obsolete) between these last two lines; a marginal row of white dots between the end of the venules and the hind wings at the bottom of each scallop; fringe dark-brown; under side pale-gray, dusted, and with five or six wavy, blackish, obscure lines, with dusky scales between, the outer submarginal line forming a broad, blackish shade on the fore wings, mingled with the broad, blackish border; also a submarginal row of whitish points on both wings.

Length of body, ♂, 0.52; ♀, 0.45; of fore wing, ♂, 0.60, ♀, 0.62; expanse of wings, 1.35 inches.

Virginia (Graef); North Carolina (Dr. Kneeland, Mus. Bost. Soc. Nat. Hist.); Georgia and Alabama (Grote); Texas, July, September, and October (Belfrage); "Florida, Georgia" (Walker); Bermuda Islands (J. M. Jones).

This species may be known by the dark-brown color and the unusually blackish lines and border of the wings beneath. The fore wings are much as in *P. californiata*, but the hind wings are much less deeply scalloped.

PHILEREME CALIFORNIATA Packard. Plate 9, fig. 15.

Scotosia californiata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 399, 1871; xvi, pl. I, fig. 12, 1874.

It is dull-ash; palpi blackish. Fore wings crossed by very fine, numerous, wavy, parallel, black lines; base of wing dull-ash, crossed by a slender black line, and edged with black, beyond which is a pale, whitish line, succeeded by a broad dusky band, and beyond is a whitish band, situated on the basal third of the wing; beyond are four black, wavy lines, crossing the middle of the wing; three submarginal, black, finer lines, and well marked on the costa, below consisting of venular black dots; a marginal, zigzag, distinct, black line; fringe dull-ash. Hind wings clear, much paler, without any bands except four short, wavy lines near the inner angle; a black, zigzag,

marginal line following the deep points of the well-scalloped edge of the wing; beneath, the wing is clear and paler than above, but yet rather dusky, with black costal bands, and two obscure rows of testaceous venular spots; the zigzag marginal line is very distinct. Hind wings thickly dusted with black scales, with three obscure rows of venular dots on the outer half of the wing, and the marginal black line very distinct; the discal dots small, but present on each wing. Legs black, ringed with white.

Length of body, ♂, 0.50, ♀, 0.50; of fore wing, ♂, 0.70, ♀, 0.75; expanse of wings, 1.25–1.50 inches.

California (Edwards): Sanzadito, Cal., February 8, September 24, October 7 (Behrens).

This species may be known by its dark wings the hinder pair being more deeply scalloped than in *P. albosignata*.

Compared with *Triphosa dubitata*, the apex is more pointed, the costal edge less rounded, and the palpi are stouter and shorter.

PHILEREME MEADIATA Packard. Plate 9, fig. 16.

Scotosia meadii Pack., Sixth Rep. Peab. Acad. Sc., 41, 1874.

3 ♂.—This is structurally closely allied to *S. californiata* Pack.; the hind wings being deeply scalloped. It differs, however, in the fore wings being rather larger in proportion to the hind wings, and the scallops on the hind wings are larger and shallower. The lines on the fore wings are more distinct, with a distinct discal dot. Body and wings cinereous; the ground-color darker than in *P. californiata*. Fore wings with three double, wavy, blackish, parallel lines before the distinct discal dot; beyond, a scalloped dusky line, and nearly half-way between the discal dot and the outer edge of the wing a double scalloped line, making a large acute angle opposite the apex of the wing, and well scalloped below the third median venule; a submarginal, faint, white, zigzag line; a marginal black line; fringe paler, concolorous with the wing. Hind wings concolorous with the fore wings, scarcely darker externally than toward the base, with five scallops edged with black; a faint discal dot; beneath, paler than above, grayish fawn-color, with the discal dots black, prominent, those on the fore wings twice as large as those on the hind wings; four dark costal spots, the two outer sending off faint, wavy, dusky lines toward the middle of the wing, which, between the outer line and the apex, is faintly spotted with white and dark on the venules.

Hind wings with a large double bunch of hairs pointing upward and downward. Abdomen with a pencil of hairs around the under side near the tip.

Length of body, σ , 0.59; of fore wing, σ , 0.77; expanse of wings, 1.60 inches.

This is very nearly allied to *P. rhamnata* of Europe. My specimens are all in bad condition, but the species is so well marked as to be recognizable from the above description and the figure.

TRIPHOSA Stephens.

Heromyia Hübn. (in part), Verz., 330, 1818.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 52, 1828.

Triphosa Steph., Nomencl. Br. Ins., 41, 1829; "Cat. Br. Lep., ii, 139, 1829."

Larentia Dup. (in part), Lep. France, viii (v), 358, 1830.

Triphosa Steph., Ill., iii, 259, 1831.

Larentia Bours. (in part), Gen. Ind., 204, 1840.

H.-Sch. (in part), Schm. Eur., iii, 141, 1847.

Triphosa Steph., Cat. Br. Lep., 209, 1850.

Scotosia Guen. (in part), Phal., ii, 140, 1857.

Triphosa Standinger, Cat., 78, 1861.

Scotosia Walk. (in part), List Lep. Het. Br. Mus., xxv, 1342, 1862.

Head as in *Philereme*. Palpi much longer than in that genus, extending far beyond the head; third joint not easily distinguishable. Male antennae very finely ciliated. Fore wings short and broad; costa much arched toward the rectangular apex; outer edge much less oblique than usual, deeply scalloped. Hind wings long, extending well beyond the end of the abdomen; the inner edge long, with no ear or brush, the outer very deeply scalloped, much more so than in any other genus of the subfamily, the points of the scallops being very long and acute. Venation: much as in *Philereme*; the inner subcostal cell much smaller than the outer. Hind legs as in *Philereme*. Abdomen long and slender, with lateral crests, and a well-marked, square, long, anal tuft. Coloration: much as in *Philereme*.

This genus differs from *Philereme* in the long palpi and abdomen, and the very deep, sharp scallops in the hind wings especially. It comprises the largest species of the subfamily.

TRIPHOSA DUBITATA Stephens. Plate 9, fig. 18.

Phalana-Geometra dubitata Linn., Syst. Nat., x, 524, 1758.

"*Geometra dubitata* Hübn., Schm. Eur., tab. 51, fig. 265, 1796."

Acidalia dubitata Treits., Schm. Eur., vi (ii), 69, 1828.

Triphosa dubitata Steph., Nomencl. Br. Ins., 41, 1829.

Larentia dubitata Dup., Lep. France, viii (v), 362, pl. 195, fig. 5, 1830.

Triphosa dubitata Steph., Ill., iii, 262, 1831.

Larentia dubitaria Boisd., Gen. Ind., 205, 1840.

H. Sch., Schm. Eur., iii, 112, 1847.

Euphosa dubitata Steph., Cat. Br. Lep., 209, 1850.

Scythia hirsutata Guen., Phal., ii, 444, 1857.

Scythia dubitata Guen., Phal., ii, 445, 1857.

Walk., List Lep. Brit. Mus., xxv, 1342, 1862.

3 ♂ and 1 ♀.—This is a large, pale-cinereous species, with a reddish tinge. The fore wings are crossed by three reddish, zigzag bands, the basal one being curved angularly on the costa; beyond are three very zigzag lines, interrupted by two paler bands; the middle reddish band is less curved than the basal one, accompanied on the inner side by a dusky band; this line contracts slightly opposite the small, dark, narrow, oblique, discal spot, which is nearer the line than in the European specimen; this line also contracts on the inner edge; the outer line is irregularly scalloped, but is straight on the costa, with a subacute, curved angle on the lower subcostal nervule, below which is a broad, regular sinus, rounded out, terminating in the middle of the first median space, but not nearly upon or just below the first median nervure, as in the English specimen; below, the line is regularly scalloped between the nervules; beyond, the submarginal line is much more dusky than in the English moth, with two faint rows of white strigæ on the nervules, with a distinct, white, submarginal line, and a black, linear scalloped line; fringe dusky. The hind wings are crossed by two distinct, but rather diffuse, dusky, submarginal lines, which are more distinct beneath, and do not appear in the English specimen; beneath, it is more dusky than in the specimen from England, with the outer line on the fore wing differing from the European moth as described above.

Length of body, ♂, 0.70, ♀, 0.55; of fore wing, ♂, 0.95, ♀, 0.80; expanse of wings, 2.00 inches.

Caribon Island, Straits of Belle Isle; Montreal, Canada (Lyman); Eagle Lake, Northern Maine, early in September (Packard); Brookline, Mass., May 21 (Shurtleff); Sierra Nevada, Cal. (Edwards).

Specimens of this species, which were collected in Hudson's Bay Territory by Barnston, and also in Canada, were referred by Mr. Walker, in the Catalogue of the Lepidoptera in the British Museum, to a variety of the common European *dubitata*.

Our Labrador species agrees well with a specimen from the Fish River Lakes in Northern Maine; and they seem to present indications of a climatal variety of the European form. We have compared a Labrador and a Maine specimen with a single English specimen.

The Californian examples (*S. lasitata* Guen.) are considerably larger than eastern examples, with (as Guenée remarks) the wings more pointed. Length of wing in Californian example, 0.95; in the Maine one, 0.80 inch.

Larva.—"Mr. Crewe thus describes the caterpillar: "The ground-color is pale yellowish-green, with two whitish-yellow, central, dorsal stripes; there are two subdorsal stripes also whitish-yellow; the spiracular stripe is bright-yellow and orange; the back and sides are occasionally studded with a few black tubercles, and always with a few short, whitish hairs; the belly is destitute of markings. It feeds on the common buck-thorn (*Rhamnus catharticus*), and is full-fed about the middle of June, when it forms an earthen cocoon, and therein changes to a dark reddish-brown chrysalis."—Newman's British Moths, 176.

Herrich-Schaeffer states that in Europe the larva feeds on the sloe or wild plum, "stone-fruit," and white-thorn.

The moths fly in June and September in Europe and this country.

LOBOPHORA Curtis. Plate 1, figs. 14, 14a.

Trichopteryx Hübn. (in part), Verz., 323, 1818.

Lobophora Curtis, Brit. Ent., 81, 1825.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 5, 1828.

Lobophora Steph., Nomencl. Br. Ins., 14, 1829.

Amathia Dup., Lep. France, xiii (x), 486, 1830.

Lobophora Steph., Ill. in, 276, 1834.

Boisd., Gen. Ind., 207, 1840.

H.-Sch., Schm. Eur., iii, 178, 1847.

Steph., Cat. Br. Ins., 199, 1850.

Lederer, Verh. Bot. Zool. Ges. Wien, 249, 1853.

Guen., Phal., ii, 364, 1857.

Standinger, Cat., 77, 1861.

Walk., List Lep. Het. Br. Mus.

Head large, front broad and full, more so than usual. Palpi slender, varying much in length, usually not extending beyond the front; but in *L. viridata* of great length, extending beyond the head by a distance equal to the length of the latter; third joint small, conical, almost indistinguishable from the second joint. Male antennae very slender, not ciliated, annulated. Fore wings broad and triangular, or long and rather narrow, but the degree of fullness of the costal and outer edge the same; when the wing is long and narrow, the outer edge is oblique; costa straight; apex obtuse. Hind wings either short or moderately long, the apex suddenly subacute; outer edge short, rounded; at the base of the inner edge of the wing, in the male, a prominent oval or linear swelling. Venation: one, usually two, very unequal

subcostal cells: the inner, when present, small; the first three subcostal venules very short and equal in length: the two discal venules are, in their united course, oblique. Male hind legs long and slender; tarsi sometimes of unusual length, much longer than the tibiae. Abdomen long and slender, sometimes extending beyond the hind wings. Coloration: the wings are thinly covered with scales; they are pale, often almost whitish, with dark, wavy lines especially marked on the veins, while the hind wings are clear, or with a single faint line.

This genus is at once recognizable by the small hind wings, which only extend in flight as far as the inner angle of the fore wings; by the prominent lobe on the hind wings in the male; and by the large, full head, and slender, usually rather short, palpi. In some of the characters, the genus closely approaches *Glaucopteryx*, and also *Eupithecia*, so that the long-winged species may be mistaken for those of the latter genus, the writer having erred in this respect. Fig. 14*a* represents the venation of *L. montanata*. The second cross-cell beyond the anterior discal appears to be an anomaly.

It is possible that *Eupithecia cretacea* belongs to this genus.

Larva—"Caterpillars of medium length, smooth, velvety, not attenuated, with distinct lines; head heart-shaped, with prominent anal points. Living exposed on trees or shrubs. Chrysalides subterranean."—Guenée.

Synopsis of the Species.

A. Fore wings short and broad; hind wings very short:

- Fore wings broader than in any other species; hind wings white, with no lines except the marginal *L. inequaliata*.
 Fore wings broad and short; discal dots distinct; two broad, flesh-colored bands. *L. montanata*.
 Fore wings rather broad, greenish; hind wings smoky *L. viridata*.

B. Fore wings long and narrow; hind wings long:

- Fore wings very acute; whitish-ash, with a broad, smoky shade beyond the extra-discal line; discal dot linear, and confluent with a black streak on median vein; otherwise much as in the next species *L. verrucata*.
 White, tinged with pale-green, with a deeply-sinuate extradiscal line touching the discal dot, and a double, sinuous hair-line half-way between the extradiscal and outer edge of the line. *L. angulilineata*.
 Like *angulilineata*, but larger, and with heavier, less sinuous lines; the submarginal regularly scalloped, chalky-white, with several scalloped dark lines. *L. geminata*.

LOBOPHORA INEQUALIATA, *sp. nov.* Plate 9, fig. 20.

1 ♀.—Fore wings short and very broad; outer edge as long as the inner; apex subrectangular. Hind wings very short and small, the apex subacute.

Body and fore wings pale-gray, the latter crossed by numerous dark-brown lines: a double basal line, scarcely bent on the costa, succeeded by a broad, diffuse, dusky band, irregular on the edges: just before the middle of the wing, and separated from the broad band by a narrow whitish space, is a double line, irregularly sinuous in its course: on the outer half of the wing are four indistinct scalloped lines, especially marked on the veins: a large, dark apical cloud and two twin patches below the apex: fringe dirty-white, checkered indistinctly with brown. Hind wings white, with a few dusky scales near the outer edge: a black marginal line: fringe white. No discal dots to be seen above, but beneath are four, those on the fore wings being linear: a slightly-marked extradiscal scalloped line: but the entire under side is dirty-white.

Length of body, ♀, 0.35: of fore wing, ♀, 0.58: expanse of wings, 1.15 inches.

Long Island, N. Y. (H. K. Morrison).

This species belongs to the same section as *L. montanata*, but the fore wings are still broader and the markings very different. It also differs in the hind wings being unspotted, except the usual marginal line, and in the absence of the discal dots on the upper side.

LOBOPHORA MONTANATA Packard. Plate 9, fig. 21.

Lobophora montanata Pack., Sixth Rep. Peab. Acad. Sci., 40, 1874.

3 ♀.—Closely allied to *L. halterata* and *carpinata* of Europe and Asia. The fore wings large and broadly triangular: the hind wings very small, short, and triangular: the apex much pointed. Body and wings whitish-ash. Head and palpi darker. Fore wings with a broad, dark, basal band, widest on the costa: a median paler band, dark on the costa, and enclosing the sub-linear, rather large, discal spots: edge of wing with a broad, blackish border, the veins darker: a row of fine black dots on the extreme edge: fringe white on both wings. Hind wings dull-white, with a faint, dusky margin along the outer edge: a faint, minute, discal dot: a very narrow black line on the extreme edge of the fringe: beneath whitish, tinged with pale flesh-color along the costa: discal dots larger than above, distinct: beyond are two dusky, scalloped lines, the inner sinuous and angulated below the costa, the outer most distinct on the venules: these lines common to both wings. Fore legs dusky: hind legs whitish.

Length of body, 0.40; of fore wing, 0.54; breadth, 0.28; of hind wing, 0.38; breadth, 0.25; expanse of wings, 1.10–1.15 inches.

(Quebec, Canada (Belanger); Amherst, Mass., June 21 (L. W. Goodell); Colorado, June 28 (T. L. Mead); Montreal, Canada (Caultfield).

L. hutterata, to which this species seems nearest allied, occurs in Central and South Europe and Middle Lapland, while *L. carpinata* is found in Central and Southern Europe, and also Eastern Siberia, the Ural Mountains, and Amur.

The specimens from Quebec and Amherst, Mass., differ from the Colorado example in being whiter, with less of a flesh-colored tint, and with the lines less distinct on the hind wings; but there is no essential difference in the markings.

LOBOPHORA VIRIDATA Packard. Plate 9, fig. 19.

Lobophora viridata Pack., Fifth Rep. Peab. Acad. Sc., 56, 1873.

2 ♂ and 1 ♀.—Head greenish, with ashen and blackish scales. Palpi of great length, porrect, large and stout, black, with a few light-cinereous scales; at extreme tip whitish. Fore wings diffusely greenish along the costa; median vein and inner margin with black strigæ and scales; a broad, basal, black, curved line, dentate on the internal vein and widening on the costa; beyond, a broad, greenish band, with several rows of black, longitudinal strigæ; a broad, mesial, dark band, one-half as wide on the internal edge as on the costa, dusky, with black scales and streaks, and on the outer edge enclosing at the base of the first median space a green patch, also a broad, longitudinal, apical patch; outer edge dark-cinereous; fringe pale. Hind wings pale, immaculate; beneath uniformly pale, with a dusky line common to both wings, and a slight discal dot; on the base of the inner edge of the hind wing is a long, blister-like expansion of the wing, by which this genus may readily be recognized, besides its long, slender wings, with apex much produced, and the very large, long palpi. Antennæ simple, annulated also with white. Legs dark, ringed with white. The hind wings extend nearly a third of their length beyond the end of the abdomen.

Length of body, ♂, 0.37, ♀, 0.34; of fore wing, ♂, 0.45, ♀, 0.44; expanse of wings, 0.95 inch.

Montreal, Canada (Caultfield); Brunswick, Me. (Packard); New York (Grote); Philadelphia, Pa. (Amer. Ent. Soc.).

This species is readily known by its wings being green along the costal edge and at base, and by its rather small size, and the numerous lines on the fore wings, often represented by dark dots.

LOBOMORA VERNA. Packard. Plate 8, fig. 13.

Eupithecia vernata Pack., Fifth Rep. Peab. Acad. Sci., 57, 1873.

3 ♂ and 3 ♀.—Head whitish, snow-white on edge of front, with a black hair-line just below the antennae. Palpi white beneath, second joint black, third white. Body and wings pale-whitish cinereous. Fore wings much sharper at the apex than in *L. angustilineata*; basal half of fore wings nearly white, with a black, linear, basal line, curved and angulated outward strongly on the median space, and sinuated inward on the submedian interspace; a black linear dot, often connecting with a black streak on the median vein; a few brownish and yellowish scales in the middle of the wing; veins irregularly spotted with white and black; an outer broadly sinuate line, very regularly incurved below the median vein, and, in front of that, going nearly straight to the costa, and touching the hind end of the discal spot; from this line proceed linear black streaks along the veins, especially marked on the median branches, which become interrupted toward the outer edge; the line is broadly and diffusely shaded with pale smoke-brown externally, darker next the line; beyond is a geminate, sinuous line of brown scales, partially obsolete below the median vein, and especially marked on the costa and in the extradiscal space; a marginal row of geminate, black dots. Hind wings smoky-white, with no markings; fringe white, with a smoky-brown line; beneath pale-white; the fore wing with the outer curved line faintly marked, and a little beyond intervenular, black dots; fringe pale-whitish. Hind wings dusky. Fore legs dark, ringed with white.

Length of body, 0.45; of fore wing, 0.60; expanse of wings, 1.30 inches.

Montreal, Canada (Lyman); Brunswick, Me. (Packard); Brookline, Mass., April 28–May 29 (Shurtleff); New York (Grote); Albany, N. Y. (Lintner); Philadelphia, Pa. (Ent. Soc.).

One of the earliest insects that flies, appearing in April in Maine, before the snow is off. It is easily known by its large size, its white, acic. wings, with the distinct, linear, black, sinuate lines, the outer shaded diffusely with light-brown, and by the white and black spots and streaks on the veins and

their branches. It differs from *L. anguilineata* (Grote), to which it is very closely allied, by the sharper apex of the fore wings, its whitish-ash color, wanting the green tint of *anguilneata*, though, in one specimen (from Pennsylvania), there is a yellowish-green tinge along the inner and outer lines. The discal dot is much more linear, and often connected with the black streak on the median vein, not present in *L. anguilneata*. The broad shade beyond the extradiscal line is wanting in *L. anguilneata*, while the present species wants the geminate, black patch in the middle of the outer margin. The two species are very closely allied, but may be separated on these characters. It varies considerably. The Pennsylvania specimen differs most from the northern examples in having three large, dark, irregular, somewhat triangular, costal spots, the middle one beginning the extradiscal line and ending as a spot opposite the discal dot. There is also a large costal spot between the costal termination of the basal and extradiscal lines.

This may prove to be *L. fusifasciata* Walk., as remarked by Dr. Speyer in a letter to Mr. Lintner.

LOBOPHORA ANGUILINEATA Packard. Plate 8, fig. 12.

Eupithecia anguilneata Grote, Ann. Lye. Nat. Hist. N. Y., viii, 28, pl. 15 A, fig. 16, 1867.

1 ♂.—This fine species is very similar to *L. vernata*, but differs in the following particulars: The wing is clearer and more deeply tinged with green, the markings are heavier, and the submarginal line is more sinuous, while it is interrupted in the extradiscal space by two short, heavy, black, parallel lines, which converge on their inner terminations.

Length of body, ♂, 0.48; of fore wing, ♂, 0.60; expanse of wings, 1.25 inches.

“Massachusetts to Pennsylvania” (Grote).

Specimens may yet be found connecting *L. vernata* with this.

LOBOPHORA GEMINATA Packard. Plate 8, fig. 14.

Eupithecia geminata Grote, Proc. Ent. Soc. Phila., vi, 29, pl. 3, fig. 6, 1866.

3 ♂.—Pure white, spotted with black. Head white, with a black line between the antennae. Palpi black, with dependent white hairs beneath, and with the third joint white. Antennae long and very slender, scarcely ciliated, annulated with white above. Prothorax above tinged with luteous; on meso-scutum a transverse band. Fore wings with five rows of black lines, formed

of partially-disconnected dots, the first three angulated obtusely on the sub-costal veins; discal dot distinct below, the two outer lines sinuate, with intermediate dots on the veinlets; a row of marginal, black dots; fringe pure-white. The hind wings pure-white, with no discal dot; beneath, the rows of dots appear, though faintly. Hind wings with a discal dot more distinct than on the upper side. Abdomen white with a row of black streaks on each side of the general line of the body. Legs whitish-cinereous.

Length of body, ♀, 0.50; of fore wing, ♀, 0.70; expanse of wings, 1.45 inches.

Cambridge, Mass. (Harris Coll.); Massachusetts (G. W. Peck); New York (Grote).

This beautiful species is readily distinguished, as it is pure white, with deep-black rows of dots spreading out along the veins. The white front, with black palpi tipped with white, and the black line between the wings, further serve to separate it from the other species.

Desiderata.

Lobophora fusifasciata Walk., List Lep. Het. Br. Mus., xxv, 1258, 1862. Nova Scotia; New York.

Lobophora ? nigrirata Walk., List Lep. Het. Br. Mus., xxv, 1259, 1862. Saint Martin's Falls, Albany River, Hudson's Bay Terr.

Lobophora ? incommodata Walk., List Lep. Het. Br. Mus., xxv, 1259, 1862. Nova Scotia.

CARSIA Hübner. Plate 1, fig. 15.

Carsia Hübn., Verz., 336, 1818.

Larentia Treits., Schim. Eur., vi, cm, 75, 1828.

Anitis Dup., Lep. France, iv, 111, 1829.

Larissa Curtis, Brit. Ent., 321, 1839.

Celma Steph., Ill., iii, 242, 1831.

Anitis Böisd., Gen. Ind., 201, 1840.

Larentia H.-Sch., in part, Schim. Eur., iii, 141, 1847.

Celma Steph., Cat. Br. Lep., 183, 1859.

Anitis Lederer, Verh. Bot. Zool. Ges. Wien, 248, 1853.

Carsia and *Anitis* Guen., Phal., ii, 193, 195, 1857.

Anitis Standinger, Cat., 77, 1861.

Carsia and *Anitis* Walk., List Lep. Het. Br. Mus., xxv, 1439, 1441, 1862.

Head broader and fuller than in *Lobophora*, with a pointed interpalpal tuft. Palpi long and rather slender, extending well beyond the head; second joint widening toward the end; third minute, very acute, not very distinguishable from the hairs of the second joint. Male antennae ciliated.

Fore wings long and narrow, subfalcate; apex much produced, acute; costa straight, sinuous; outer edge unusually oblique, very full, and rounded in the middle. Hind wings very much produced toward the subacute apex, so that they are oval in shape, the inner edge being no longer than the outer. Venation: two equal subcostal cells; the three first subcostal venules short, but the first much longer than the second; the discal venules are directed at right angles to the costa. Hind legs very long and slender in the male; the tarsi very long, equaling the tibiae in length. Abdomen long and slender. Coloration: dark-gray, with two broad double lines on the fore wings, the extra-discal one toothed, with a double flexure; no markings on the dark hind wings.

The acute, narrow subfalcate fore wings, and the narrow hind wings, with the inner edge no longer than the outer, and the broad, full head, separate this genus from any of its allies. The sexes differ considerably, the wings being much narrower in the female than in the male.

I see no reason for separating *Anaitis* from *Carsia*.

CARSIA PALUDATA, Guenée. Plate 9, fig. 22.

- "*Geometra paludata* Thunberg, Mus. Nat., 76, fig. 12, 1788."
 " *Geometra sororiata* Hübner, Schum. Eur. tab. 68, fig. 355, 1796."
 " *Geometra imbutata* Hübner, Schum. Eur. tab. 78, fig. 403, 1796."
Carsia sororiata Hübner, Verz., 336, 1818.
Carsia imbutata Hübner, Verz., 336, 1818.
Larentia sororiata Trötsch, Schum. Eur., vi (ii), 86, 1828.
Larissa imbutata Curtis, Brit. Ent., 321, 1839.
Celma imbutata Steph., Ill., iii, 242, 1831.
Anaitis imbutaria Boisd., Gen. Ind., 204, 1840.
Anaitis sororiaria Boisd., Gen. Ind., 204, 1840.
Larentia sororiaria H.-Sch., Schum. Eur., iii, 164, 1847.
Celma imbutata Steph., Cat. Br. Lep., 184, 1850.
 " *Anaitis pruinaria* Eversmann, Bull. Moscow, ii, 639, 1851."
Carsia imbutata Guen., Phal., ii, 494, 1857.
Carsia paludata Guen., Phal., ii, 494, 1857.
Carsia imbutata Walk., List Lep. Het. Br. Mus., xxv, 1110, 1862.
Carsia paludata Walk., List Lep. Het. Br. Mus., xxv, 1110, 1862.
Carsia boreata Pack., Fifth Rep. Peab. Acad. Sci., 52, 1873, ♂.
Carsia alpinata Pack., Fifth Rep. Peab. Acad. Sci., 52, 1873, ♀.

3 ♂.—Front and palpi blackish, with white scales; thorax dark, with light scales. Fore wings of a peculiar ash-color, dark on the outer edge and on the base of the costa. A narrow band just beyond the basal third of the wing narrower and less angulated than in the other species, being curved, and just below the costa slightly angulated; on the costa and inner side it is single, in the middle double, being within paler, dark brown. A similarly-colored parallel band, but more irregular, externally in the middle of the

wing broadly tridentate, the lower tooth rounded and set in as the line contracts; it is paler in the middle of the wing, darker on the edges. A submarginal, parallel, diffuse band, widening on the apical half, interrupted opposite the middle and more prominent tooth of the middle line by a geminate rather indistinct rusty spot, which is not so distinct as in the other species. Fringe long, dusky, checkered with white opposite the ends of the venules. Wings more thickly scaled than usual, and venules not so prominent. Hind wings dark slate-color; fringe spotted with white. Fore wings beneath nearly concolorous with the upper side of the hinder pair; a slight ferruginous tinge toward the costa. Hind wings much paler, cinereous, with reddish scales. An outer line goes from the costa toward the middle of the wing.

Length of body, 0.48; of fore wing, 0.55; expanse of wings, 1.15 inches.

Taken half-way between the Summit and the "Ledge", Mount Washington, N. H., August 18 (Shurtleff); Tuckerman's Ravine, Mount Washington (Sanborn).

This sex may be determined by its dark slate-color, without any rusty-red tinge on the fore wings above, and less beneath than in the female; also by the large teeth of the outer band and the narrower inner band.

3 ♀.—Ferruginous ashen slate-color; front reddish. On the fore wings, a basal oblique linear cross-line; a middle broad line, regular, and angulated distinctly just below the costa, below which the line is double. Discal dot small but distinct. Outer line narrow, doubly curved, and finely zigzag, on the outer side twice dilating, and finely toothed, opposite which are two rusty red spots, interrupted by two faint lines. Without, a darker line proceeds from the middle of the wing obliquely toward the apex. Fringe long, spotted conspicuously with white. Hind wings plain, slate-colored, with no marks. Beneath, the fore wings are slate-colored, becoming rusty-red toward the costa and outer edge; hind wings dull reddish beneath, with a slight purplish tinge, and an extradiscal dark line more distinctly marked than in the other species. Fringe not so distinctly spotted with white as on the fore wings.

Length of body, 0.35; length of fore wing, 0.50; expanse of wings, 1.10 inches.

Readily known by the red under side, the broad reddish band, the outer, waved, finely dentate band, and the two ferruginous spots opposite each bend of the line.

I quite agree with Staudinger in regarding *paludata* as a variety of *imbutata*. Specimens received from Professor Zeller, labeled *sororiata*, show no differences, even varietal, from ours.

Larva.—Newman (Brit. Moths) says that *Carsia imbutata* feeds on the Cranberry (*V. oxycoccus*); Freyer describes it as "reddish yellow, with three wide stripes down the back; spiracular line yellowish white". (Stainton's Manual, ii, 120.)

ODEZIA Boisduval. Plate 1, fig. 16.

Baptia Hübn. (in part), Verz., 306, 1818.

Psolas Treits., Schm. vi (i), 254, 1827.

Tanagra * Dup., Lep. France, vii (iv), 112, 1829.

Minoa Steph., Nomencl. Br. Ins. 45, 1829.

Tanagra Dup., Lep. France, viii (v), 523, 1830.

Minoa Steph., Ill., iii, 293, 1831.

Odezia Boisd., Gen. Ind., 229, 1840.

Steph., Cat. Br. Lep., 218, 1850.

Lederer, Verh. Bot. Zool. Ges. Wien, 216, 1853.

Tanagra and *Odezia* Guen., Phal., ii, 517, 518, 1857.

Odezia Standl., Cat., 76, 1861.

Tanagra and *Odezia* Walk., List Lep. Het. Br. Mus., xxv, 1460, 1461, 1862.

Baptia Grote, Proc. Ent. Soc. Phila., ii, 67, 1863.

Head broad and full between the eyes; no interpupal tuft. Palpi short and slender, but much broader than in *Lobophora*, scarcely extending beyond the front; third joint sharp, minute, scarcely distinguishable from the end of the second joint. Male antennae rather thick, finely ciliated. Fore wings broad, short, triangular, the costa regularly arched, apex much rounded; outer edge short, moderately full, less oblique than usual. Hind wings rather long, somewhat produced toward the much-rounded apex, not extending to the end of the abdomen. Venation: a single large subcostal cell; the first subcostal venule nearly twice as long as the second, all the three first venules much longer than in *Carsia*. Posterior discal venule oblique, curved a little very near the independent vein. The first and second median venules co-originating. The median and independent veins very long. Hind legs of male with the tarsi much shorter than the tibiae. Abdomen long and rather thick; tip hardly tufted. The species are uniformly deep black, with white bands; the hind wings entirely black or partly so.

In this genus, the wings are short, broad, and much rounded at the apex; these characters, with the black hues, separate it from all the others of the subfamily.

* Preoccupied in Ornithology.

Summaries of the Species.

Fore wings broad; apex subrectangular; one broad, white band *O. albocollata*
 Fore wings elongated, with thin, narrow, black bands *O. californiata*

ODEZIA ALBOCOLLATA Guenée. Plate 9, fig. 23.

Odezia albocollata Guen., Phil., ii, 529, 1857.

Baptia callofasciata Grote, Proc. Ent. Soc. Phila., ii, 63, pl. 3, fig. 2, 4, 1863.

3 ♂ and 3 ♀.—Body and wings uniformly black. Fore wings rather broad; apex subrectangular, outer edge much less oblique than in *O. californiata*; a single, very broad, white band extends from the middle of the costa to the inner angle of the wing, where it is suddenly forked; opposite this fork the fringe is white, as also on the apex. Hind wings black, with the fringe white on the apex and near the inner angle. Beneath marked as above, with the addition of a short, sinuous, white line within the broad band, and traces of a basal line, represented by a white costal spot, and another in the submedian space. On the inner half, the hind wings are gray, with a large, black, discal spot; beyond this a black band, with a broader white band. Abdomen whitish beneath. Legs whitish.

Length of body, ♂, 0.40, ♀, 0.34; length of fore wing, ♂, 0.48, ♀, 0.45; expanse of wings, 0.90–1.00 inch.

Brunswick, Maine (Packard); near Boston, Mass. (Minot); Salem, Mass., June 13, July 1 (Cassino); Amherst, Mass., June 19 (Goodell); New Jersey (Sachs); Brooklyn, N. Y. (Graef); Detroit, Mich. (Swartz, Mus. Comp. Zool.); Boulder Cañon, Colo., about 6,500 feet elevation, July (Packard, Hayden's Survey), Pike's Peak (Grote); Victoria, Vancouver Island, July (Crotch).

There seems to be no difference in size or markings between Eastern and Pacific-coast examples.

ODEZIA CALIFORNATA Packard. Plate 9, fig. 24.

Baptia californiata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 404, 1871.

This pretty species is black, with three narrow, waved, white bands crossing the fore wings; the two basal ones connect on the inner edge of the wing, where they form a circular ring, inclosing a black spot; above they are equidistant, and are dentate on the median vein, the teeth advancing toward each other. The outer line is very sinuate, widening much in the middle, and thence sending a linear sinuate line to the inner angle of the wing.

Close to the outer edge of the wing and opposite the rounded bend in the outer band, is a round, white spot. A minute white spot on the inner angle. Hind wings with a large, black, oval discal spot; beyond an indistinct black line, and beyond this a broad, white band, widening outward in the middle and connected with a round, marginal, white spot; another white spot on the inner angle. These markings are distinctly repeated on the under side of the wings.

Length of body, 0.35; fore wing, 0.47; expanse of wings, 0.98 inch. California (Behrens).

HELIOMATA. Plate 1, fig. 17.

Helionata Grote, Proc. Ent. Soc. Phila., vi, 29, 1866.

Head rather narrower than in *Odezia*, but the palpi and antennæ the same. Fore wings inclined to be narrower than in *Odezia*, the costa straighter; the apex is much less rounded, being subrectangular, while the outer edge is a little more oblique. The hind wings are shorter, inclined to be sinuous below the apex, which is shorter, much less produced than in *Odezia*. The venation differs in the subcostal cell being smaller, in the first subcostal vein co-originating with the main vein, not being separated as usual, and there is one subcostal vein less; while the last subcostal vein is bent downward where it throws off the anterior discal venule. The first median is widely separated from the second at its origin, in this respect differing much from *Odezia*. Male hind legs with the tibiæ much swollen, the tarsi one-half as long as the tibiæ. Abdomen longer and slenderer than in *Odezia*, extending beyond the hind wings. Coloration: black, with large white blotches, with metallic scales arranged in lines and patches.

As seen by the characters given above, this genus differs from *Odezia*, to which it is nearest allied, by some important features, which serve to connect it with the third subfamily.

The swollen hind tibiæ and short tarsi and its peculiar style of coloration will enable one to recognize the species. Grote remarks that "*H. crota* Grote from Surinam belongs to this genus, and probably other species hitherto referred to *Eratcina*, the types of which latter genus are quite distinct from the present."

Synopsis of the Species.

Of large size, two whitish-yellow bands nearly meeting in the middle of the fore wing = *H. infulata*.
 Like *infulata*, but with only two metallic lines, and with the yellowish bands united . . . *H. claborata*.
 Smaller than the other two, with two-thirds of the hind wings white, two marginal blue
 metallic lines *H. cyclobata*.

HELIOMATA INFULATA Grote. Plate 9, fig. 26.

Baptria infulata Grote, Proc. Ent. Soc. Phila., ii, 67, pl. 3, fig. 1, ♀, 1863.

Erutima infulata Grote, Proc. Ent. Soc. Phila., iii, 542, 1864.

Heliomata infulata Grote, Proc. Ent. Soc. Phila., vi, 39, 1866.

1 ♂ and 1 ♀.—Black-brown: fore wings blackish-brown, with two broad yellowish-white bands, one extending from the outer third of the costa to the middle of the wing, ending in the second median venule; the other extending from the middle of the inner edge of the wing to the base of the first and second median venules. Just beyond is a submarginal, metallic, blue, broad line much farther from the outer edge of the wing than in *H. cyclobata*. A similar marginal blue line. The band on the hind wings is continuous with the hinder band of the fore wings, but wider, though only half as wide as in *H. cyclobata*. Beneath much as above, with the costa more or less pale; fringe dark.

Length of body, — *l*: of fore wing, ♂, 0.50; ♀, 0.45; expanse of wings, 0.90–1.00 inch.

Brooklyn, N. Y. (Graef); Northern Virginia (Grote).

HELIOMATA ELABORATA Grote.

Baptria claborata Grote, Proc. Ent. Soc. Phila., ii, 67, pl. 3, fig. 5, ♂, 1863.

Erutima claborata Grote, Proc. Ent. Soc. Phila., iii, 542, 1864.

Heliomata claborata Grote, Proc. Ent. Soc. Phila., vi, 39, 1866.

“Anterior wings blackish at the base, and terminal space with a broad yellow band traversing the median space of the wing, interrupted at the center and contracting as it reaches the internal margin. Posterior wings with the basal half yellow, showing a few powdered black atoms at extreme base and with the terminal margin entirely black. There is a faint terminal metallic line, and a black line runs through the yellow median bands. Under side resembling the upper, with the legs and under surface of body powdered with yellow atoms.

A male expands $\frac{7}{8}$ inch. Collection of Entomological Society of Philadelphia. *Hab.*—Virginia.

Resembles *B. infulata*, but is, I think, distinct. There is but a single metallic line, and the disposition of the yellow median bands is different.”

HELIOMATA CYCLADATA Grote. Plate 9, fig. 25.

Heliomata cycladata Grote, Proc. Ent. Soc. Phila., vi, 30, pl. 3, fig. 7. ♀, 1866.

2 ♂.—A smaller species than *H. infulata*, with narrower, more pointed fore wings. Body and wings blackish brown: abdomen ringed with white, with a broad white band at the base of the abdomen. Fore wings black-brown, with the markings arranged much as in *H. infulata*, but with the bands whiter, broader, and more irregular, and with a brown patch between the points of the two opposing bands. The submarginal metallic blue line is very much more sinuous near the costa than in *infulata*. The hind wings are almost entirely snow-white, dark at base and on the outer edge, with two blue lines. Fringe blackish-brown. Beneath much as above, with a longitudinal subcostal blue sheath and a broad interrupted metallic blue line.

Length of body, ♂, 0.35; of fore wings, ♂, 0.43; expanse of wings, 0.85 inch.

"West Farms, N. Y. (Angus)"; Brooklyn, N. Y. (Graef and Sepper); "New York State (Ent. Soc. Phila.)".

HETEROPHELPS Herrich-Schaeffer. Plate 1, fig. 18. Plate 2, fig. 18.

Heterophelps Herr.-Sch., Ausserent. Schin., 62, 1850-58.

Guenée, Phal., ii, 513, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1457, 1862.

Head only moderately broad and full, the sides of the front parallel. Palpi short and slender, not reaching to the front of the head; third joint minute, conical. Male antennæ with very large stout cilia, a pair to each joint. Fore wings unusually large, costa full, sinuate, apex subacute; outer edge a little bent on the first median. Hind wings small, rather short, apex suddenly but obtusely pointed; the outer edge full and rounded, extending to the tip of the abdomen. Venation: two subcostal cells; the first subcostal venule nearly twice as long as the second and third. Hind legs thick, short, the tarsi much shorter than the long tibiae. Male abdomen moderately stout, ending in a well-marked tuft. The ground-color is a whitish ochreous-gray, with three black conspicuous costal spots, and a faint extradiscal line; no discal spots.

This well-marked genus differs from any other of the subfamily by the heavily-ciliated antennæ, very short palpi, large slightly angular fore wings, and small, rounded, obtusely-pointed hind wings. The markings are almost identical in the two species.

Nothing is known regarding the early stage of the genus.

Synopsis of the Species

Large, whitish gray *H. atrigutta*.
 Much smaller, with a decided ochreous tinge *H. triguttata*.

HETEROPHELPS n. sp. (Plate 9, fig. 27.)

1 ♂ and 1 ♀.—Nearly twice as large as *H. triguttata*, but with the wings of similar shape, and with similar markings. Body and wings dull, nearly white instead of ochreous, while *H. triguttata* has a shining lustre. Fore wings with three large costal patches, the inner the larger. From the third and smaller one runs a slight line curved outward in the middle of the wing. On the hind wing, the corresponding line is narrow, very faintly indicated, and bent at nearly right angles in the middle of the wing. No discal dots above; below they are well marked on both wings, those on the fore wings being sublinear. Beneath, the wings, body, and legs are tinged decidedly with ochreous.

Length of body, ♂, 0.50, ♀, 0.50; of fore wing, ♂, 0.67, ♀, 0.66; expanse of wings, 1.12 inches.

Ithaca, N. Y. (Smith and Comstock); Middle States (Glover); New York (Harvey); "St. Martin's Falls, Hudson's Bay Terr." (Walker).

This large species would not at first sight be thought to be a *Heterophelps*, but it really agrees very closely in its structure and markings, only differing in the much larger size and whitish tint from *H. triguttata*.

Walker's *Heterophelps atrosignata* does not belong to this genus.

HETEROPHELPS TRIGUTTATA Herrich-Schaeffer. (Plate 9, fig. 28.)

Heterophelps triguttaria H.-Sch., Ausserour, Schum., 62, pl. 11, fig. 202, 1850-56.
 Guen., Phal., ii, 514, 1857.
 Walk. List. Lep. Het. Br. Mus., xxy, 1857, 1862.

6 ♂ and 6 ♀.—Uniformly pale ochreous; hind wings concolorous with the anterior pair. Fore wings with three blackish, conspicuous, costal spots (rarely sending as many faint lines across the wing). The basal spot is square, the middle one larger, subtriangular, situated near the outer third of the costa. The third spot is usually much smaller than the two others and situated rather nearer the apex than the middle spot. Often a very sinuous (not wavy) row of minute black dots extends across the wing from the middle spot. No other markings; no marginal black line as in *H. harrisiata*. No discal dots. Beneath, no markings, except two minute costal spots.

Length of body, ♂, 0.35, ♀, 0.35; of fore wing, ♂, 0.46, ♀, 0.45; expanse of wing, 1.00 inch.

Brunswick, Me. (Packard); Cambridge, Mass. (Harris Coll.); Boston, Mass. (Sanborn); Amherst, Mass. (Goodell); Waterbury, Conn., July 9 (W. H. Patton); Brooklyn, N. Y. (Graef); Oneida, N. Y. (Hawley); New Jersey (Sachs).

This is one of the most common of our geometrid moths, and may be recognized by its uniformly pale ochreous hue, the three black costal spots, and the absence of any other markings.

Larva.—Cylindrical. Head medium sized, rather flat in front, pale green, slightly bilobed, without any markings; mandibles tipped with black (labrum a little paler than the other parts of the head)—a few very fine small hairs visible only with a magnifying-glass. Body bluish-green, with thickly-set longitudinal stripes of whitish and yellowish. A double whitish dorsal line with a yellowish-white line rather more prominent on each side of it (these are not unbroken, but formed of a succession of yellowish short lines and dots). Below this on each side are two or three imperfect white lines made up of short broken streaks, much fainter than those above. The spaces between the segments are yellowish; the skin is much wrinkled and folded. The under side is green, with tinge of yellowish between the segments; abdominal legs yellowish-green and faintly tipped with brown. Chrysalis, June 19. It feeds on the maple." (From notes received from Mr. W. Saunders, of London, Canada.)

LITHOSTEGE Hübner. Plate 1, fig. 19.

Gypsoschroa Hübn. (in part), Verz., 337, 1-18.

Lithostege Hübn., Verz., 337, 1-18.

Minoa Treits. (in part), Schm. Eur., vi (ii), 248, 1828.

Siona Dup. (in part), Lep. France, viii (v), 537, 1830.

Boisd. (in part), Gen. Ind., 229, 1-19.

Chesias H.-Sch. (in part), Schm. Eur., iii, 181, 1-17.

Lithostege Lederer, Verh. Bot. Zool. Ges. Wien, 248, 1853.

Guen., Phal., ii, 501, 1-57.

Walk., List Lep. Brit. Mus., xxv, 1117, 1862.

Head large, broad, and very full in front, more so than usual. Palpi long and rather large, extending well beyond the head; second joint long and rather broad; third minute, and nearly indistinguishable from the projecting hairs of the second. Antennae of male very slender, not ciliated. Fore wings very long and narrow, much produced toward the rather obtuse

apex: the outer edge very oblique and long, not bent, fully as long as the inner edge. Hind wings very long and narrow, regularly oval in outline, the costal edge long and straight, apex rounded; the inner edge merged with the outer, more so than in *Carsia*. Venation: two short subcostal cells, the first three subcostal venules subequal, the origin of second and third adjacent; the median venules very short. Fore legs with the tibiae short and very thick, armed with a large projecting spine in both sexes; hind legs long and slender, tarsi much longer than the tibiae. Male abdomen large, thick, long, extending to an unusual distance beyond the hind wings. Coloration: pale whitish-gray, with three rows of black spots on the fore wings.

This genus, remarkable for the spines on the fore legs, somewhat resembles *Carsia* in the long fore wings and oval hinder pair, but differs in the venation. The head is unusually full in front, and the palpi are large, while the antennae are not ciliated.

Synopsis of the Species.

Large, hind wings oval *L. triseriata*.
Smaller, hind wings rounded *L. rotundata*.

LITHOSTEGE TRISERIATA Packard. Plate 9, fig. 30.

Lithostegia triseriata Pack., Sixth Rep. Peab. Acad. Sci., 39, 1874.

1 ♂ and 1 ♀.—Form of the body and wings much as in *L. farinata* Hufn. of Europe. The wings are a little more rounded at the apex, especially in the female: the form of the head is the same: the palpi, however, are a little longer, and the two unequal spines on the fore tibiae a little shorter than in the European *L. farinata*. Body and wings whitish-cinereous, part of head and palpi dark brown. Fore wings whitish-ash, with three series of conspicuous black, mostly venular, spots: the inner row within the basal third of the wing; one obscure costal spot, another situated on the median vein, a longitudinal black spot in the interspace below and another on the internal vein. Beyond the middle of the wing, an oblique line of about eight longitudinal black venular spots, and just beyond a row of about eight black venular dots. A submarginal, slightly sinuous, broad, white line, with an apical scallop. Fringe whitish, with a blackish marginal line. Abdomen and hind wings uniformly smoky-ash, with no markings. Beneath, both wings smoky-ash; around the edges, especially of the fore wings, finely dusted with white. Two or three subapical costal faint spots. Fringe white, with a subbasal dark line, and faintly checkered.

Length of body, ♂, 0.44, ♀, 0.60; of fore wing, ♂, 0.54, ♀, 0.64; expanse of wings, 1.25 inches.

Denver City, Colo., 1 ♂ June 3, ♀ June 27, in the Rocky Mountains of Colorado (T. L. Mead).

The occurrence of this genus is of much interest, as it constitutes a new link between the Pacific States and European fauna. The male of this species is much smaller than the female, with the hind wings especially much elongated. The outer row of black dots is wanting in my single specimen.

LITHOSTEGE ROTUNDATA Packard. Plate 9, fig. 29.

Lithostegia rotundata Pack., Sixth Rep. Peab. Acad. Sci., 39, 1871.

2 ♂.—This is a much smaller species than *L. triseriata*, and the hind wings are shorter and much more rounded. The markings are very similar. Head and palpi with black and white scales, the palpi stout. The fore tibial spines stout. Fore wing with the same markings as in *L. triseriata*, but with the outer submarginal white line narrower and more distinct. The third row of black dots wanting, as in the male of the Colorado species. Fringe and hind wings and under surface as in the Colorado species. A dark apical oblique streak on the fore wing, not present in *L. triseriata*.

Length of body, 0.40; of fore wing, 0.49; expanse of wings, 1.00 inch.

San Diego, Cal. (G. R. Crotch, Mus. Comp. Zoöl.).

This species, while closely resembling *L. triseriata*, resembles the European *L. firinata* more closely in the peculiar shape of the hind wings than the Colorado species. The fore wings are a little more broadly triangular than in *L. triseriata*.

Subfamily OPEROPHETERINÆ Packard.

Male.—The single genus of this group is so different from the *Larentinae* on the one hand, and the *Fidoniinae* on the other, that it seems warrantable to suggest a new subfamily for it. It certainly has no immediate affinities with the *Larentinae*. With *Hybernina* and *Anisopteryx*, the affinities are remote. The head is short and small; the body, especially the thorax, unusually slender. The palpi are unusually weak and short, not reaching out as far as the front. The front of the head is nearly as wide as long. Male antennae densely ciliated. The wings are large and broad. Fore wings with the costa

straight, curving around toward the very much-rounded apex; the outer edge is as long as the inner. The hind wings are unusually long and large, projecting far beyond the end of the abdomen, and with the outer edge much rounded. Venation: the first, second, third, and fourth subcostal venules are remarkably short; the large subcostal cell is situated nearer the apex than usual. The origin of the first median venule is remote from the others; the lower discal venule is long and very oblique. Hind legs with the tarsi slender and as long as the tibiae.

Female.—Partially wingless, with the wings small and narrow, not reaching to the end of the abdomen. The body is short and stout, and much pointed toward the end. For other characters see page 41.

OPEROPTERA Hübner. Plate 4, fig. 20.

Operoptera Hübner, Verz., 321, 1818.

Acidalia Treits., (in part), Schm. Eur., vi (iii), 5, 1828.

Chimantobia Steph., Nouvel. Br. Insc., 41, 1829; "Cat. n. 112, 1829."

Larentia Dupé. (in part), Lep. France, vii (v), 358, 1839.

Chimantobia Steph., Ill. in, 274, 1831.

Larentia Boisdu. (in part), Gen. Ind., 201, 1840.

Chimantobia H. Sch., Schm. Eur., iii, 177, 1847.

Steph., Cat. Brit. Lep., 197, 1850.

Chimantobia Lederer, Verh. Bot. Zool. Ges. Wien, 251, 1855.

Chimantobia Guen., Phal., ii, 258, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1166, 1862.

The characters of this genus are provisionally like those of the subfamily. The male of our single species may readily be identified by the large, thin, partially hyaline, pale ochreous wings, with the numerous brown, scalloped wings.

Although usage has, in a degree, sanctioned Stephen's more euphonious name, Hübner's name was accompanied by a diagnosis, while Stephen's was, up to 1831, a simple catalogue-name. The law of priority compels us here, as elsewhere, often against our own will, to reject a useful name for one older and therefore more lawful.

Larva.—"Caterpillars short, slightly attenuated at the extremities, cylindrical, a little flattened beneath, with distinct lines; head globular, smaller than the prothoracic ring; living on fruit-trees, contained in a folded leaf, from which it eats circular pieces. Chrysalis contained in a small, oval, subterranean cocoon."—Guenée.

OPTEROPHITERA BOREATA Hübner. Plate 9, fig. 31.

"*Geometra boreata* Hübner, Schum. Eur., fig. 113, 114, 1796."

Opacophthera boreata Hübner, Verz., 321, 1-18.

Acidalia boreata Treits., Suppl., 201.

Larentia boreata Boisd., Gen. Ind., 204, 1-40.

Dup., Lep. France, Suppl. iv, 32, pl. 53, fig. 3, 1842.

Chromatobia boreata Hl.-Schl., Schum. Eur., iii, 177, fig. suppl. 353, 1847.

Steph., Cat. Brit. Lep., 197, 1-50.

Guen., Phal., ii, 269, 1-57.

Walk., List Lep. Het. Br. Mus., xxiv, 1167, 1-62.

17 ♂.—Body and wings, including the head and palpi, uniformly testaceous or dull ochreous-brown. Wings thin, semi-transparent. Fore wings with about eight well-marked scalloped lines, the points of the scallops black, and usually resting on the veins. The middle and extradiscal lines are curved outward just below the costa, the three extradiscal lines being close together and forming a mesial shade on the wing, but the three submarginal lines beyond are not curved. Discal dot distinct and black. Fringe concolorous with the wings, with black venular dots. Hind wings clear, with a faint extradiscal diffuse line curved opposite the distinct discal dot; this line is often obsolete; beneath, this and the extradiscal line make a diffuse shade common to both wings. Discal dots distinct on both wings.

Length of body, ♂, 0.32-0.43; fore wing, ♂, 0.46-0.65; expanse of wings, 0.95-1.30 inches.

♀.—The female has not yet occurred in collections in this country.

A single female *boreata*, so labeled by Zeller, is pale gray, with simple antennae. The front of the head is dark brown or chocolate-color; the palpi at base concolorous with the body, the last joint chocolate-brown, and both pairs of wings are rather large and broad, rounded at the end with a long fringe and reaching to the apical fourth of the abdomen. The legs are gray, and the hinder pair are rather stout. The front wings have two parallel black lines, a little oblique; and the distance between them as great as half the width of the wing. The single female *brunata* differs in the slenderer body, the narrower head, the shorter narrower wings, the two parallel bands on the anterior pair being represented by a broad black patch; the wings only reach as far as the middle of the abdomen. The legs are slenderer, particularly the hinder pair, which are dark-ringed, with a paler tint; but this specimen seems fresher than the *boreata*, in which the color of the legs bears the marks of being faded.

From the female of *Anisopteryx*, it differs in the broader, less full, bulging front of the head, the quite well-developed wings, and the stouter hind legs.

Alaska, several specimens taken on marshes, near Saint Michael's, September 20, 1867, clinging to blades of grass (Dall, Mus. Peab. Acad. Sc.); White Mountains, N. H., November (Packard, Mus. Peab. Acad. Sc.); Fort Randall, Dakota Territory (Dr. E. Cones); London, Canada (Saunders); Portland, Me. (Morse); Norway, Me. (S. F. Smith, Mus. Comp. Zööl.); Andover, Mass., November (Sanborn, Mus. B. S. N. H.); Natick, Mass. (Stratton, Mus. B. S. N. H.); Brooklyn, L. I., N. Y. (Graef).

This species is not so common with us as in Europe, where it rivals *Anisopteryx* in its abundance and injurious effects. The only difference I can detect between this and *O. brumata* (Linn.) is in the form of the discal space of the hind wings; in the latter, the outer end is broader and more rounded than in most of my examples of *O. boreata*, the distance between the origins of the second and third median venules being less in *brumata* than in *boreata*. Judging by the males of the two species labeled by Professor Zeller, I do not see on what grounds *boreata* should be separated from *brumata*.

The males differ but little except in size and in slight variations of venation. The most striking variation is afforded by a large male from Norway, Me., which is of a sea-green tint. The moth is liable to be confounded with *Anisopteryx vernata*, from which it may be readily recognized by the more rounded fore wings, its ochreous tint, the many waved lines, and, lastly, by the entirely different plan of venation.

Larva.—Newman thus describes the larva of *O. brumata*:—Head scarcely as wide as the body, and scarcely notched on the crown; the body is rather obese, decreasing in size toward each extremity. Head pale green, semi-transparent. Body glaucous-green, with a narrow, median, blackish stripe on the back, and three narrow white stripes, at equal intervals, on each side. The caterpillar of *O. boreata* is very similar to that of the winter-moth, but more transparent, and the stripes more indistinct, but it chiefly differs from that very common species in having a brown head, that of the winter-moth (*O. brumata*) being pale green and semi-transparent. It feeds on birch.

Subfamily FIDONINÆ Guenee (emend.).

Family *Macruda* Guen., Phal., ii, 61, 1857.

Family *Folionida* Guen., Phal., ii, 95, 1857.

Family *Zeroida* Guen., Phal., ii, 195, 1857.

This subfamily may be distinguished by the usually square front, the usually rather slender palpi, which are as a rule rather long, always passing

beyond the front and pointed, sometimes (*Dasypidonia*) very hairy and large, while the antennae are almost invariably well pectinated, often plumose (except in *Semiothisa*, where they are simple). The fore wings are broad, sometimes narrow and subfalcate, or, when broad, with the apex more or less rectangular, and the costa unusually straight. The hind wings are large and rounded, seldom angled. The venation is quite characteristic, the costal being often united with the subcostal, and the latter usually throwing off three short branches to the costa. Either one or no subcostal cell. The species are often high-colored, red or dark brown or deep ochreous, with dark or lighter lines and spots. Abdomen very long and slender, much more so than usual.

Larva.—“Caterpillars elongated, cylindrical, ordinarily without swellings or eminences; head globular, as wide as the prothoracic ring, with the anal part terminated by two horizontal points; generally living on low plants. Chrysalides usually subterranean.”—Guenée.

In Guenée’s “*Zerene*”, the caterpillars are described as short, rather thick.

I do not see good grounds for separating the “*Macaride*” from the “*Vidonia*”, as the differences are very slight; while the “*Vidonia*” of M. Guenée certainly merge insensibly with his “*Vidonia*”.

Synopsis of the Genera.

Fore wings long and narrow, two subcostal cells.....	<i>Gorytodes</i> .
Like <i>Aspilates</i> , but with two spines on base of fore tibiae.....	<i>Eucaspilates</i> .
Wings broad; antennae heavily pectinated; palpi long, acute.....	<i>Aspilates</i> .
Fore wings green; palpi large, broader than in <i>Aspilates</i>	<i>Chloraspilates</i> .
Like <i>Aspilates</i> , but wings narrow; palpi stouter.....	<i>Stenaspilates</i> .
No subcostal cell; wings very long and narrow; palpi very obtuse.....	<i>Tornos</i> .
Antennae very plumose; wings broad, snow-white.....	<i>Zerene</i> .
Palpi slender; antennae plumose; fore wings narrow, much pointed; deep ochreous, with pink extradiscal lines.....	<i>Hamatopsis</i> .
Palpi rather bushy; front square; antennae thinly pectinated; colors red and brown.....	<i>Elythria</i> .
<i>Adalua</i> -like; costa of fore wings full, outer edge very oblique; palpi large.....	<i>Eucrofidonia</i> .
Six subcostal venules; hind tibiae swollen; tarsi short.....	<i>Eufidonia</i> .
Fore wing long and rounded; front with a chitinous crest.....	<i>Perconia</i> .
Differs from <i>Ematurga</i> in the subcostal cell being open; antennae with short branches; hind wings short and square; clypeus flat; species of small size.....	<i>Vidonia</i> .
Antennae very bushy, front full.....	<i>Ematurga</i> .
Antennae bushy; palpi very large and bushy.....	<i>Dasypidonia</i> .
Male antennae ciliated; apex of the fore wings rectangular.....	<i>Orthofidonia</i> .
Male antennae heavily pectinated; palpi short and thick; fore wings somewhat pointed, but not falcate.....	<i>Caripeta</i> .
Male antennae plumose; fore wings with the apex acute, square; male abdomen very slender.....	<i>Schidoscma</i> .
Male antennae simple, flattened.....	<i>Lozogranma</i> .
Male antennae well pectinated, ochreous-yellow.....	<i>Eufitchia</i> .
Male antennae either well pectinated or only ciliated; palpi unusually long.....	<i>Thaunonoma</i> .
Like <i>Thaunonoma</i> , but with fore wings not falcate; hind wings marbled beneath.....	<i>Marmopteryga</i> .

Fore wings slightly falcate; costa straight; outer edge bent; hind wing square, subdorsum long and slender; hind tibiae swollen *Phasiana*.
 Fore wings less subfalcate than in *Phasiana*, with rather square hind wings *Pseudomastodes*.
 Fore wings distinctly falcate; hind wings more or less angular *Scamothisa*.
 Like *Scamothisa*, but the male antennae heavily pectinated; the markings somewhat as in *Fidonia* *Lundacarat*.

GORYTODES Guenée. Plate 2, fig. 1.

Gorytodes Guen., Phal., ii, 179, 1857.

Platua H. Sch., Ausserer, Schim., 64, 1850-53.

Male antennae plumose, much as in *Aspilates*. Palpi long and slender, extending far beyond the front, as in *Aspilates*, but not so acute at the ends. The front of the head narrows more anteriorly than in *Aspilates*. Fore wings unusually long and narrow, with the apex much produced, falcate, the outer edge full, oblique, more or less sinuous, and (*G. uncanaria*) dentate; the costa straighter than in *Aspilates*. Hind wing much produced toward the apex. Venation: the costal vein unites for a greater distance than usual with the subcostal vein, finally throwing off a very short vein; two subcostal cells; the apical cell very long; discal venules very oblique. Hind legs long and slender, tarsi a little shorter than the tibiae. Abdomen very long and slender.

This genus differs from *Aspilates*, to which it is nearly allied, chiefly in the long falcate fore wings, the more acute hind wings, and in having two instead of one subcostal cell.

Whether Herrich-Schaeffer's name was proposed and his figure published before the publication of Guenée's, or not, seems uncertain; but as the latter's was accompanied by a full, comparative description, I see no reason why it should not be retained.

Synopsis of the Species.

One submarginal line; antennae broadly pectinated *G. uncanaria*.
 Two submarginal lines; antennae with short pectinations *G. trilinearia*.

GORYTODES UNCANARIA Guenée. Plate 9, fig. 32

Gorytodes uncanaria Guen., Phal., ii, 180, 1857.

Platua velifornaria H. Sch., Ausserer, Schim., 64, fig. 537, 1850-53.

Pack., Proc. Bost. Soc. N. H., xvi, 24 pl. 1, fig. 24, 1874.

4 ♂.—Body and antennae (which are broadly pectinated) pale ash, concolorous with the hind wings. Fore wings ash, speckled with brown, with

two dark, short, longitudinal streaks, one on each side of the base of the median vein. The costal half of the middle area of the wing occupied with a large, low, irregular, triangular dark-brown area, edged externally with darker; apex ending in a knob, in one specimen produced angularly outward, and connected with (sometimes separated from) an irregularly oval patch under the third median venule, and which is traversed by a longitudinal mesial white line. A sinuate, white, marginal line, beginning just before the apex, and ending on the inner angle, and edged within with dark brown. Fringe pale ash, checkered with blackish. A black conspicuous discal dot, in rubbed specimens centered with white. Hind wings pale ash, with a faint discal dot, and a dark, narrow, marginal line. Beneath, more or less marbled with dark speckles. Fore wings with two parallel white lines, fading away below the costal region, a slight ochreous tint along the costa; a faint discal dot. Hind wings pepper-and-salt, with two dark, parallel, broad shades, angulated on the discal interspace, the outer line nearly touching the edge of the wing; discal dot larger and more distinct than on the fore wings.

Length of body, 0.60; of fore wing, 0.75; expanse of wings, 1.50 inches.

California (Edwards); San Diego, Cal. (Crotch, Mus. Comp. Zoöl.).

A fresh specimen received from Mr. Edwards differs from certain others more rubbed (and which better agree with M. Guenée's description) in having the large oval brown spot below the median vein of the fore wings distinctly united with the large costal triangular area, and in the more distinct bands on the under side of the wings.

The broadly-pectinated plumose antennæ, the single sinuous submarginal line, separate this species from *G. trilinearia*, in which the pectinations are less than one-half as long, and in which there are two parallel, sinuous and angulated, submarginal lines.

GORYTODES TRILINEARIA Packard. Plate 9, fig. 33.

Gorytodes trilinearia Pack., Proc. Ent. Soc. N. H., xvi, 24, pl. I, fig. 23, 1874.

2 ♂.—Whitish-ochreous. A larger species than *G. uncanaria*, the antennæ with much shorter pectinations, the palpi as long, but slenderer, the wings of the same form, but with the apex of primaries more rounded, the

wing being a little less falcate. Fore wings white at base, and traversed by three white zigzag lines, the basal one on the inner fourth of wing, with a large angle on the submedian space, the apex of the angle filled in with a few black scales, as also the outer side of the line (widest here) in the discal space; from the submedian angle is thrown out a narrow white line, running through the middle of an oval ochreous patch. A longitudinal white streak in the discal space, and beyond a large, lunate, transverse, white spot, the two forming a very distinct exclamation-mark. Beyond, two parallel zigzag white lines, the inner scalloped deeply below the first median venule; the outer is curved at the apex, and with a broad angle on the independent vein. Fringe white, checkered with dark brown. Hind wings white, fringe white. Beneath as above, but the hind wings are crossed by two irregular, rather distinct and broad bands of ochreous with black scales, and the base of the wing is faintly peppered with dark and ochreous scales.

Length of body, 0.66; of fore wing, 0.82; expanse of wings, 2.30 inches.

Nevada (Edwards); Arizona (Dr. Palmer, from the Museum of the Department of Agriculture at Washington).

An exceedingly elegant moth, at once recognizable by the three white lines, the mark of exclamation in the discal space and the narrowly-pectinated antennae. The specimen from Arizona is in bad condition, but does not seem to differ from the Nevada example.

EUASPILATES Packard. Plate 2, fig. 2.

This genus is intermediate in some respects between *Aspilotes* and *Sterrhia*, with characters of its own. The head is like that of *Sterrhia*, but much fuller in front, with short palpi not projecting beyond the front. The antennae are pectinated as in *Sterrhia*, much less so than in *Aspilotes*. The fore wings are long, triangular, much produced toward the apex. The costa sinuous, slightly curved in before the apex. The outer edge much longer than in either of the two other genera, and very oblique. Hind wings rounded, much as in *Sterrhia*. The venation differs from *Sterrhia* and is much as in *Aspilotes*. There is one subcostal cell and one subcostal venule less than in *Aspilotes*. Two large, unequal, stout spines on the base of fore tibiae, wanting in *Sterrhia* and *Aspilotes*. Legs much shorter and stouter than in either of those two genera.

EUASPILATES SPINATARIA Packard.

Euspilates spinataria Pack., Sixth Rep. Peab. Acad. Sc., 45, 1874.



1 ♂.—Body and wings pure white. Fore wings with four pale clay-brown, oblique lines, the basal very oblique and extending along the inner side of the subcostal vein a third of the length of the wing. The second line half-way between the basal and the third, and half as wide as third, embracing the dark, discal, linear spot. Fourth line marginal; fringe white on both wings. Hind wings pure white, with a small, dark, discal dot, and a narrow pale-brown line along the edge. Beneath as above, but with the lines much fainter, and with four distinct discal dots.

Length of body, 0.40; of fore wing, 0.54; expanse of wings, 1.15 inches.

Colorado Territory (A. R. Grote, Mus. Peab. Acad. Sc.).

This very interesting form may be recognized by the full bulging head, the short palpi and stout spines on the base of the fore tibiae, and by the white wings, with the four peculiar, pale-brown, broad bands on the anterior pair.

ASPILATES Treitschke. Plate 2, fig. 3.

Erastris Hübn., Samml. Exot. Schm., 1806.

Syrphodia Hübn., Zutr., 371, 372; Verz., 300, 1818.

Peccania Hübn. (in part), Verz., 296, 1818.

Catopyrrha Hübn., Verz., 330, 1818.

" *Ensarea* Hübn., 5, v, 40, 1822."

Aspilates Treits., Schm. Eur., vi (1), 126, 1827.

Steph., Ill., iii, 207, 1831.

" *Parabella* Sadoiff., Bull. S. I. Mosc., 47, 1837."

Aspilates Boisd. (in part), Gen. Ind., 187, 1840.

H.-Sch., Schm. Eur., iii, 93, 1847.

Steph., Cat. Brit. Lep., 181, 1850.

Lederer, Verh. Bot. Zool. Ges. Wien, 238, 1853.

Guen., Phal., ii, 180, 1857.

Catopyrrha Walk., List Lep. Het. Br. Mus., xxiv, 1064, 1862.

Aspilates Walk., List Lep. Br. Mus., xxiv, 1065, 1862.

In this genus, the male antennæ are usually heavily pectinated, the head square in front, and the palpi very long and acute, porrect. The fore wings are short and broad, triangular; costa straight, or curved; apex rectangular, not falcate. Hind wings rounded at the apex, outer edge full and rounded. Venation: three short subcostal venules; one subcostal cell. Hind legs: male hind tibiae somewhat swollen; tarsi two-thirds as long as the tibiae. Abdomen rather long and slender. Coloration: usually pale, with from one

to four lines on the fore wings, the wings beneath more or less reddish in some species.

This genus may be identified by the very heavily pectinated male antennæ, the long, very slender palpi, and the high-colored under side of the wings of the larger species.

Synopsis of the Species.

Whitish straw color, with four pale brown lines..... *A. 4-fasciaria*.
 Whitish ochreous, often thickly speckled with brown scales, a straight outer line ending
 on the apex, the wing often brown beyond..... *A. perraria*.
 Granite-gray, with a vinous tinge; tinged beneath with bright red..... *A. coloraria*.
 Bright ochreous, tinged beneath with vermillion..... *A. discolorata*.
 Dull reddish, ochreous, with two obscure black interrupted lines, and an outer row of
 black spots on the fore wings..... *A. latimaculata*.

ASPILATES QUADRI-FASCIARIA Packard.

Aspilates 4-fasciaria Pack., Fifth Rep. Peab. Acad. Sci., 62, 1873.



Aspilates 4-fasciaria.

♂.—About the size of, and allied structurally to, *A. gilvaria* of Europe, but differing much in the marking; it is rather smaller than *A. perraria*; compared with the latter, the antennæ are not so widely pectinated; the fore wings are of much the same shape, but the costa is much more convex, while the outer edge is less so, and the hind wings are not so fully rounded. Body and wings uniformly pale yellow-ochreous, fringe concolorous. Fore wings crossed by four faint darker bands, straight, parallel, the second in the middle of the wing the widest; the two outer ones nearer together than either of the others, the fourth band not reaching the apex, and narrower than the others. On the hind wings three similar bands. Beneath as above, with the lines reproduced and not much less distinct than above.

Length of body, ♂, 0.46; of fore wing, ♂, 0.57; expanse of wings, 1.20 inches.

Kansas (T. Glover, from United States Agricultural Department); Lawrence, Kans. (Snow); Boulder, Colo., June 29 (Packard, Hayden's Survey).

This species differs so much from any others we have that its pale ochreous color, without any dark specks above or below, and the four slightly oblique parallel bands, will enable one easily to determine it.

This is one of the most common Geometrid moths found in Colorado. It occurs in the valleys leading from the plains up among the foot-hills, and will undoubtedly be found in river-valleys on the plains away from the mountains.

ASPILATES PERVARIA Packard Plate 9, fig. 34.

Aspilates pervaria Pack., Fifth Rep. Peab. Acad. Sc., 62, 1-73.

6 ♂ and 5 ♀.—Smaller than *A. dissimilaria* Hübn.; antennæ broadly pectinated, but the branches not inclined to be caught together, being stiffer; palpi one-half smaller. Fore wings less pointed at apex; hind wings not extending beyond tip of abdomen, while in *A. dissimilaria* they reach a little way beyond. Cream-white (rarely snow-white), with a very slight ochreous tinge. Front of head and palpi brown. Both wings either quite clear or finely speckled, or with heavy, large-brown specks. A single outer, oblique, brown line on primaries (sometimes wanting) fading out just before reaching the costa, sometimes the wing beyond the line is shaded with brown. Discal dots dark, distinct on both wings (varying in size on either pair). Beneath much as above; the single line usually reproduced. The discal dots very distinct.

Length of body, ♂, 0.50-0.57, ♀, 0.50; of fore wing, ♂, 0.60-0.70, ♀, 0.56-0.60; expanse of wings, 1.35 inches.

Papineau, Mo. (Riley); Texas, May 21-23; Oct. 3-Nov. 11 (Beltrage, Mus. Peab. Acad. Sc.). This very variable species may be recognized by its whitish-speckled wings, with a single outer brown line on primaries, the wing beyond sometimes tinged with brown; also by the presence of the dark discal dots. It is in some respects allied to the European *Aspilates gilvaria*. It is evidently double-brooded.

The single Missouri specimen differs from all the Texas examples in being snow-white above and beneath. The oblique submarginal line is represented by a few scattered dark scales, the middle of the wing being clear of them, while beyond the line and on the costal edge they are quite thickly scattered, as also over the hind wings, so that the whole moth is without any markings except the speckles.

ASPILATES COLORARIA Guenée. Plate 9, figs. 35, 36.

"*Phalaena coloraria* Fabr., Suppl. Ent. Syst., 96-97, 1798."

Crociphora accessaria Hübn., Zutr., 26, figs. 503, 504, 1825.

? *Geometra cruentaria* Hübn., Europ., tab. 10, fig. 48."

Aspilates cruentaria Freits., *Schm. Ent.*, VI, 1903, 1827.

?Dup., *Lep. France*, VII, 1915, pl. 179, fig. 8, 1830.

Aspilates coloraria Guen., *Phala.*, II, 1883, 1857.

Calophrissa cruentaria Walk., *List Lep. Br. Mus.*, XXV, 1905, 1867.

Crociphora coloraria var. *spharomacheria* Harvey, *Bull. Soc. Nat. Sci. Buenos*, 2-4, 1887.

♂ 1 ♀ .—Of the same size as *dissimularia*; dark stone-gray, speckled with blackish. Male antennae dark gray; those of the female annulated finely with gray and whitish, exactly as in *A. dissimularia*. Palpi as in *dissimularia*, but deeper red. The cut of the wings is almost exactly as in *dissimularia*; the position and form of the outer band is the same; both wings, however, are dull stone-gray, with a vinous tinge, especially on the fringe. An inner dusky band crosses the site of the discal dot, and runs parallel to the outer line, but is more decidedly curved on the costa. Half-way between the middle band and the insertion of the wing is a still more curved basal band. The wing is speckled with dark scales; and in the middle of the wings, just outside of and touching the outer line, is a dark spot not present in *dissimularia*. On the hind wings are two mesial, dusky bands, not observed or nearly obsolete in specimens of *dissimularia*. Under side of both wings tinged more or less with a decided bright brick-red, with the two outer bands repeated as above, but less curved and more distinct, the inner one running just inside of the distinct black discal dot. The basal line is wanting. The two bands distinct. Legs pale-gray. Abdomen concolorous with the rest of the body and wings.

Length of body, ♂, 0.60; of fore wing, ♂, 0.65; expanse of wings, 1.10 inches.

London, Canada, May 31 (Saunders); Brooklyn, Long Islands (Graef); Albany, N. Y., May 16–June 4 (Lintner); “Georgia” (Guenée).

This species is so much like *A. dissimularia* that I am inclined to regard it almost as a melanized form of that species. It differs in the much darker wings, while the under side of the wings are light brick-red, instead of vermilion. I look for the occurrence of specimens of *dissimularia*, with markings identical with those of this form, only differing in color. It will be an interesting inquiry to ascertain whether it is only a melanotic variety.

Larva.—The caterpillar is more elongated than the preceding [*A. dissimularia*], of a clear brownish-red, with the incisions darker and somewhat radiated. The dorsal spots are brown, but finer and more elongated. The head and all the feet are concolorous. It lives on *Rubus strigosus*, *altissimus*, and other species of *Rubus*.—Guenée.

Gueneé doubts whether Treitschke or Duponchel rightfully regarded this as a South-European species, and by Staudinger (Catalog) it is not mentioned as a European moth.

ASPIATES DISSIMILARIA Gueneé.

Erastria dissimilaria Hubn., Samml. Exot. Schm., bd. 1, 1896.

Catopyrrha dissimilaria Hübner, Verz., 301, 1818.

Aspilates dissimilaria Guen., Phal., ii, 182, 1857.

Catopyrrha dissimilaria Walk., Lep. Het. Br. Mus., xxiv, 1064, 1862.

5 ♂ and 2 ♀.—Head pale brown in front. Palpi yellow. Body and wings bright citron-yellow, without any markings above, but usually with three broad, dusky, slightly-curved bands on the fore wing, one basal band more curved than the others; two or three dark blotches just beyond but adjoining the outer line on the posterior half of the wing; both wings slightly speckled with fine dark scales. Hind wing with two faint, straight shades quite near together and parallel. Fringe pink yellowish at inner angle and along the inner edge.

Two females differ in the strigae and specks and bands on the fore wings (none on hind wings) being dull pink. Male antennae granite-gray, in the female white, with scattered, dark specks above. Beneath, bright ochreous-yellow; both wings crossed by two nearly parallel, broad, pink shades, with fine, scattered, dull-pink scales over the wing. Sometimes the inner band beneath is nearly obsolete, leaving large pink discal dots, and whole under surface is suffused with pink, and the body is pinkish on the sides.

Length of body, ♂, 0.55–0.60, ♀, 0.50; fore wing, ♂, 0.70–0.75, ♀, 0.72; expanse of wings, 1.35–1.50 inches.

Albany, New York, June 29; West Virginia, 3105, July 7 (Lintner); Illinois (Clemens); Georgia (Le Conte, Grote, Harris Coll., Mus. Bost. Soc. Nat. Hist.); Texas, May 3–23 (Beifrage, Mus. Peab. Acad. Sc.); Maryland (Stratton, Mus. Comp. Zool.); Long Island, N. Y., July 2 (Graef).

This species varies greatly, but may always be recognized by the bright-yellow color of the wings and the pink fringe, and dusky band above (when present), and beneath by the broad pink lines and suffused pink tint.

Hübner represents the male above with but one (outer) common band and a costal spot, the rudiment of the middle line. In the female, the three bands are present on the fore wings and one on the hind wings; the inner band only extending from the costa to the median vein. The under side of

both the male and female have two common bands, and the under surface of the female is sprinkled with dark spots besides.

Larva.—"Caterpillar of a yellowish-green, with the dorsal region clearer, limited by two subdorsal lines of a dark green. The vascular line replaced on the intermediate rings by black marks, which stop on the first half. Stigmatal line of a deep green. Head and feet scaly, red. It lives in April and May on *Trifolium*. The chrysalis is of a clear reddish-yellow color."—Gueneé.

ASPIATES LINTNERARIA Packard. Plate 9, figs. 37, 38.

Aspilates lintneraria Pack., Sixth Rep. Peab. Acad. Sc., 11, 1871.

1 ♂.—This fine large species is of the same size as *A. dissimilaria* (Hüb.), but the antennæ are less densely pectinated, though the branches are as long. The palpi are one-half as large and do not project beyond the front. The fore wings are subfalcate, acute, and the hind wings decidedly bent in the middle. Body and wings uniformly reddish fawn-brown. Antennæ horn-color. Fore wings with three narrow, parallel, more or less interrupted, blackish lines; the basal much curved; the middle one curved just below the costa, straight beyond; the outer (third) a little curved. Half-way beyond this line and the outer edge of the wing is a row of intervenular, round, black spots, edged externally with whitish. There is no spot in the extradiscal space. An oblique, blackish, apical streak. Hind wings with the same markings, wanting only the basal line, while the outer row of spots are smaller than those on the fore wings. Fringe slightly darker than above. Beneath uniformly pale fawn-brown, slightly paler than above, with no lines, but small, scattered, dark, transverse specks and four small discal dots. A row of three or four black dots near the apex. Abdomen and legs concolorous with the body.

Length of body, ♂, 0.55; of fore wing, ♂, 0.75; expanse of wings, 2.00 inches.

Amherst, Mass. (Professor Peabody); Albany, N. Y., September 14 (Lintner); London, Canada (Saunders).

Easily distinguished by its large size and bright-reddish fawn-color above and beneath, and by the three dark, narrow lines, of which the outer (third) is interrupted in the middle of the wing, two of which are continued on the hind wings; also by the outer row of black spots.

In a remarkably suffused variety (pl. 9, fig. 37), taken by Prof. S. H. Peabody either at Racine, Wis., or Amherst, Mass., but probably the former.

the region between the basal and third line on both wings is blackish, the outer edge of the broad band deeply excavated in the middle of the wing. The black spots in the outer row are larger than usual, and extend nearly to the edge of the wing, while the apical streak is broad and diffuse. The fringe is considerably darker than the rest of the wing. Beneath as usual, with the submarginal row of black spots present on both wings.

Desiderata.

Aspilates atropunctaria Walk., List Lep. Het. Br. Mus., xxvi, 1673, 1862.—*Male*. Pale yellowish fawn-colour. Head in front deep fawn-colour. Palpi pilose, obliquely ascending, not rising so high as the vertex; third joint extremely minute. Antennae broadly pectinated, except towards the tips. Abdomen slightly attenuated; apical tuft rather long. Wings rather broad, with a straight, deep, fawn-coloured line, which extends from beyond the middle of the interior border of the hind wings nearly to the tips of the fore wings, where it is retracted to the costa; discal point black. Fore wings acute, with a slight interior, angular, fawn-coloured line; costa and exterior border hardly convex, the latter rather oblique. Length of the body, 6 lines; of the wings, 15 lines. East Florida."

Aspilates abbreviata Walk., List, xxvi, 1673, 1862.—*Male*. Testaceous. Palpi broad, obtuse, obliquely ascending, not rising so high as the vertex; third joint nearly obsolete. Antennae broadly pectinated. Hind tibiae slightly incrassated. Wings rather short, with a brown discal point, and a brown, oblique, exterior, nearly straight line. Fore wings acute, minutely speckled, with two interior indistinct darker lines; marginal points brown, very small; exterior border slightly convex and oblique. Hind wings paler. Length of body, 4 lines; of the wings, 11 lines. Georgia."

Aspilates donataria Walk., List, xxvi, 1674, 1862.—*Male*. Cinereous, slender. Head broad in front. Antennae broadly pectinated. Abdomen not extending beyond the hind wings. Wings elongate, minutely blackish-speckled, with an exterior, oblique, nearly straight line of blackish points; submarginal line brownish, very indistinct; marginal points black. Fore wings acute; costa straight; exterior border hardly convex, very oblique. Length of the body, 5 lines; of the wings, 14 lines. Georgia."

Aspilates canosaria Walk., List, xxvi, 1674, 1862.—*Male*. Whitish cinereous. Head luteous in front. Palpi very short and slender, not extending

beyond the front. Antennae moderately pectinated. Legs smooth, slender; spurs rather short. Wings rather broad, minutely brown-speckled; exterior line blackish, oblique, zigzag; discal blackish, elongated. Fore wings hardly acute; interior line blackish, zigzag; costa and exterior border very slightly convex, the latter moderately oblique. Hind wings very little paler than the fore wings, extending beyond the abdomen. Length of body, 5 lines; of the wings, 14 lines. Nova Scotia."

"Var. β . Head not luteous in front. Lines and discal marks of the wings brown. Length of the body, 7 lines; of the wings, 18 lines."

Aspilates strigularia Walk., List, xxvi, 1675, 1862.—"*Male*. Cinereous. Palpi porrect, short, broad, extending a little beyond the head; third joint extremely minute. Antennae pubescent. Abdomen hardly extending beyond the hind wings. Hind tibiae slightly incrassated, with four spurs, of which the first pair are much longer than the apical pair. Wings transversely brown-speckled; marginal points black. Fore wings hardly acute; interior and exterior lines blackish, oblique, the first straight, the second undulating; space along the outer side of the exterior line partly and irregularly clouded with brown; discal mark brown; exterior border straight, rather oblique. Hind wings with some straight, indistinct, brownish lines. Length of the body, 5-5½ lines; of the wings, 13-14 lines. East Florida."

Aspilates olencusaria Walk., List, xxvi, 1675, 1862.—"*Male*. Luteous. Head rosy in front. Antennae cinereous. Wings with an oblique, nearly straight, purplish-rosy exterior line; fringe purplish-rosy; under side bright luteous, with transverse rosy speckles, and with two broad rosy bands. Fore wings with the interior and middle lines purplish-rosy, indistinct. Hind wings paler than the fore wings. Length of the body, 5½-6 lines; of the wings, 15-16 lines. East Florida. Georgia."

CHLORASPIATES, *gen. nov.*

Head, palpi, and antennae, and form of the body and legs as in *Aspilates*. Antennae of the male heavily pectinated to just before the tip. Palpi very large and broad at the end, extending far beyond the head, the third joint being small and rounded. The wings are small and narrow, somewhat as in *Lythria*. Fore wings narrow, the costa less convex than in *Lythria*, while the outer edge is much less oblique. The hind wings are a little longer and

less rounded than in *Aspilates*, but more rounded than in *Lythria*, the apex being much rounded. The abdomen is long and slender, tufted much as in *Aspilates*. The hind legs are very long and slender, the four tibial spurs long and slender; tarsi as long as the tibiae. Coloration: fore wings, head, and thorax green; abdomen and hind wings ochreous.

This genus would at first be mistaken for one of the subfamily *Gome-trinae*, from the green thorax and fore wings, but the characters are like those of *Aspilates*, as seen in the palpi, which are larger, but very much broader, in the heavily-pectinated antennae, the long slender hind legs, and the peculiar form of the abdomen. The venation is similar to that of *Aspilates*, but a careful study could not be made on the single specimen received.

CHLORASPIATES BICOLORARIA, *sp. nov.* Plate 13.

1 ♂.—Head and palpi greenish-ochreous; antennae dark brown; thorax above and fore wings deep pea-green; costa ochreous; apex, however, green. Three black small costal spots, the third one the largest and sinuate. On the basal third of the wing is a faint, pale, straight line, which ends at the same distance from the insertion of the wing on the inner edge of the wing as on the costal. A straight extradiscal dark line. No discal dot or any other markings on the front wings, which are uniformly dull-greenish. The hind wings are pale-ochreous, dusted with pinkish scales, and with a brown extradiscal line, and faint traces of a parallel submarginal one. Beneath, both wings are uniformly ochreous, with pinkish speckles, but with no markings.

Length of body, ♂, 0.13; fore wings, ♂, 0.45; expanse of wings, 0.90 inch.

Bastrop, Tex. (Meske).

This beautiful species may be readily distinguished by its small wings, the anterior pair being dull green, and the hinder pair rather bright ochreous. *Larentia profugaria* (H.-Sch., Auserreur. Schm., p. 66, figs. 410, 411) may belong to this genus; at any rate, it is allied to *Aspilates*, and does not belong to the *Larentinae*. He gives the locality as North America.

STENASPIATES,* *gen. nov.*

This genus is closely allied to *Aspilates*, but the wings are much narrower, and it differs in other important respects. The palpi are large and broad,

*σπινός, narrow, in allusion to the narrow wings; *Aspilates*

very stout, while those of *Aspilates* are long and slender; they do not extend so far beyond the front as in *Aspilates*; the third joint is short and thick; the male antennae are heavily pectinated, much as in *Aspilates*. The wings are longer and narrower; fore wings with the costa straight, becoming rounded at the apex, with the outer edge short, less oblique than in *Aspilates*. Hind wings much produced toward the well-rounded apex, the outer edge long and decidedly sinuous, not reaching to the end of the abdomen, which is long and slender.

This genus is well marked and intermediate in some respects between *Aspilates* and *Chloraspilates*. It may be recognized by the stout, broad palpi and narrow wings, the hinder pair being somewhat sinuous on the outer edge.

STENASPILATES MESKARIA, *sp. nov.* Plate 13.

♂.—Body and wings grayish-brown, with a faint olivaceous tint. Fore wings with a basal shade crossing the wing, curved broadly outward opposite the large, white, oblong, conspicuous, discal spot. The outer line is white, linear, shaded broadly within with dark brown, especially toward the inner edge of the wing; the line is parallel with the outer edge of the wing on the costal half, but posteriorly curves inward slightly and then makes a sudden curve outward, ending on the outer third of the inner edge of the wing. Beyond this line, the wing is clearer, with a few dark patches, and a submarginal, broad, light shade, disappearing before reaching the costa, but ending distinctly on the inner angle of the wing. The hind wings are concolorous with the anterior pair, but are slightly clearer, with transverse dark strigæ and two parallel dark lines, of which the inner is the more distinct. Beyond this the margin of the wing is clouded, and below the middle of the inner edge are two or three black dots. Beneath, the wings are lighter, clearer than above, with faint traces of the extradiscal line on the fore wings, while on the hind wings, besides the two short, dark, diffuse lines, is a large, black, broken, discal spot.

Length of body, ♂, 0.55; fore wing, ♂, 0.55; expanse of wings, 1.06 inches.

Texas; collection of Mr. Meske, to whom the species is dedicated.

TORNOS Morrison. Plate 2, fig. 4.

Tornos MORT., Proc. Bost. Soc. Nat. Hist., xvii, 217, 1875.

In this singular genus, the wings are so long and narrow that it might, on casual inspection, be mistaken for a Noctuid. The male antennæ are, however, heavily pectinated, exactly as in *Aspilates*; the head is moderately broad in front. The palpi are large, broad, and stout at the end, not slender and acute as in *Aspilates*. Fore wings long and narrow, costa very straight, apex subrectangular; outer edge not very oblique, much shorter than usual compared with the length of the inner edge. Hind wings much produced toward the apex, not extending beyond the end of the abdomen, and sometimes not so far as the tip. Venation: there is no subcostal cell, and but five subcostal venules, two only being thrown off to the costa, where three are in *Aspilates*. Independent vein near the last subcostal, as in *Aspilates*; but three median venules, as in all *Phalaenidæ*, there being as a rule (indeed, I know of no exception) four in the *Noctuidæ*. Abdomen as usual in *Aspilates*; male hind legs, with the tibiæ, a little swollen, and the tarsi nearly as long as the tibiæ.

This aberrant genus differs from *Aspilates* mainly in the broad, thick palpi, the long, narrow wings, and the want of a subcostal cell, and in having but five subcostal venules, six being the usual number. This genus was placed among the *Noctuidæ* by Mr. H. K. Morrison.

Synopsis of the Species.

Often light; outer edge short *T. rubiginosaria*.
Dark; outer edge of fore wing longer in proportion than in *rubiginosaria*..... *T. approximaria*.

TORNOS RUBIGINOSARIA Morrison. Plate 9, fig. 39.

Tornos rubiginosus MORT., Proc. Bost. Soc. Nat. Hist., xvii, 218, 1875.

7 ♂ and 5 ♀.—Wings long and narrow; outer edge short. Antennæ well pectinated. Body and wings usually cream-colored, chocolate-brown, sometimes brown. Fore wings with a much curved, irregular, basal, dark hair-line (often obsolete, and only represented by a square, dark, costal dot). The discal dot is composed of long, raised, blackish scales, forming a large, conspicuous tuft. Through the discal spot runs a dusky band, curved outward just below the costa (often obsolete, and represented only by a broad costal dot, situated within the discal spot). An outer, curved, sinuous, dark line, more distinct than the others, and making a great curve outward, opposite the dis-

cal dot; the line is often broken, consisting of black dots. Beyond a submarginal row of white dots the wing is blackish, and within the line it is tinged with reddish-brown. Hind wings concolorous with the anterior pair, and marked in the same manner. No basal line; extradiscal line curved and scalloped. Edge of the wing dark. Beneath dark cream color, suffused with dark scales, with a common, diffuse, dusky shade, and edge of both wings dusky. Discal dots distinct. Legs concolorous with the body, with dark scales. Abdomen somewhat carinated, and with distinct lateral projections.

Length of body, ♂, 0.45, ♀, 0.45; of fore wing, ♂, 0.45–0.56, ♀, 0.53; expanse of wings, 0.85–1.15 inches.

Lawrence, Kansas (F. H. Snow); Missouri, April 19 (Riley); Waco, Texas, May, June 29, July 12, October (Belfrage; Mus. Peab. Acad. Sci.); Demopolis, Alabama (Grote).

This is a very variable species, and it is liable to be mistaken for a Noctuid moth, the wings are so unusually narrow and the outer edge so short. It may, on this account, and from the presence of the large discal tuft of dark, raised scales, be separated from its allied forms. It is very variable, and it would be easy to "make" three species out of the specimens I have before me. The normal common form has, as a ground-color, a cream-tint; in others, from Missouri and Texas, the whole insect is suffused with a chocolate-tint so uniformly as to obscure the lines. The extradiscal line on both wings differs in distance from the discal dot. Some specimens are intermediate in hue between the dark and cream-colored examples. Some dark specimens are so much smaller than the normal size as to be easily mistaken for a distinct species.

Mr. Riley states that when the moth is at rest the abdomen is raised almost perpendicular to the thorax, while the head is held downward.

The moth is evidently double-brooded in Texas, according to the dates given by Mr. Belfrage. The figure of the larva and pupa on plate 13 are copied from Abbot.

TORNOS APPROXIMARIA, sp. nov. Plate 9, fig. 40

2 ♂. In this species, the wings are shorter and broader, the outer edge of the fore wings longer, with a rectangular apex, the antennæ with shorter pectinations than in the other species.

The body and wings are uniformly chocolate brown, both above and

beneath, including the legs. The basal black hair-line is rather farther from the insertion of the wing than in the other species; is regularly curved, not wavy, and ends the same distance from the insertion of the wing on the inner edge as on the costal edge of the wing. Just within the linear discal dot is a fine black line, curved outward from the costa to just below the median vein, where it makes a re-entering angle, and thence is directed outward again, ending obliquely beyond the inner edge of the wing; the extradiscal line runs parallel and very near to it. There are no other markings on the wing. Hind wings exactly like the fore wings, with no markings except the indistinct discal dot. Beneath of the same color as above, with no markings except the four discal dots.

Length of body, ♂, 0.33; of fore wings, ♂, 0.46; expanse of wings, 1.00 inch.

Kentucky (Samborn, Ky. Geol. Survey, Mus. Comp. Zool.).

This pretty species differs from the other by its uniformly chocolate color, and the two outer parallel sinuate lines much nearer together than usual, the inner nearly touching the discal spot.

In the museum of the Peabody Academy of Science is another species from Texas, much smaller, with very narrow wings, but with similar markings and of the same color as in the present species. The outer edge of the wing is much longer than in either of the two larger species.

ZERENE Treitschke. Plate 2, fig. 5.

Orthostixis Hübn., Samml. Exot. Schm., bd. ii, 1806.

Orthostixis Hübn. (in part), Verz., 304, 1816.

Zerene Treits., (in part) Schm. Eur., vi (ii), 217, 1828.

Guen., Phal., ii, 221, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1136, 1862.

Head of moderate size; front square, moderately full. Palpi very small and slender, acutely pointed, porrect, not projecting beyond the head. Antennae plumose, the branches thick and slender. Fore wings with the costa full, especially toward the base of the wing, the apex rectangular, outer edge much as in *Aspilates*, not very oblique, and moderately convex. Hind wings much more produced toward the apex than in *Aspilates*, and not angled in the middle. Venation in its general relations as in *Aspilates*, but there are two subcostal cells, the inner varying in size, lozenge-shaped, the outer long and narrow, linear, curved, much as in *Aspilates*. The independent vein

originates farther from the sixth subcostal than usual, while the posterior discal venule is very oblique and is not curved inward as in *Aspilates*. The arrangement of the independent vein and discal venules is much as in *Orthostiridonia*. Hind legs long and rather thick—the tarsi stout and as long as the tibiae. Abdomen long and slender. Coloration: pure white, with black antennae and black dots and lines on the wings, and a yellow head and patagia.

This genus may be recognized by having such small, acute, slender palpi, by the plumose antennae, and the double subcostal areole.

From the European *Orthostiris*, its nearest ally, it differs in the smaller palpi and plumose antennae, while it may be always distinguished from *Aspilates* by its beautiful mode of coloration and the other points already stated.

ZERENE CATENARIA Guenée.

Geometra catenaria Cramer, Pap. Exot., iii, 61, pl. 228, fig. 3, f. 1.

Geometra catenaria Drury, Ill. Nat. Hist., i, 17, pl. 8, fig. 3, 1779.

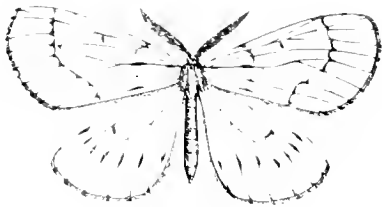
Phalana catenaria Fabr., Ent. Syst., iii, part ii, 149, 1794.

Orthostiris catenaria Hübner, Samml. Exot. Schm., bd. ii, 1806.

Eupulus catenarius Westw., ed. Drury, i, 16, pl. 8, fig. 3.

Zerene catenaria Guen., Phil. ii, 222, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1136, 1862.



Zerene catenaria.

10♂ and 10♀.—This common moth is easily recognized by its large size, the snow-white, thin wings. Head ochreous-yellow in front; thorax yellowish at the base of the patagia. Fore wings white, with a black, narrow, zigzag line on the inner third of the wing; the line is more or less obsolete, often having venular dots. A distinct discal spot. A scalloped, black line half-way between the discal dot and the outer edge. Fringe checkered with black dots. Male antennae very plumose. End of male abdomen yellowish.

A distinct discal spot. A scalloped, black line half-way between the discal dot and the outer edge. Fringe checkered with black dots. Male antennae very plumose. End of male abdomen yellowish.

Length of body, ♂, 0.70, ♀, 0.50–0.70; length of fore wing, ♂, 0.85, ♀, 0.65–0.75; expanse of wings, 1.10–1.80 inches.

Brunswick, Me., September 1–10, abundant (Packard); Portland, Me. (Morse); Salem, Mass., October 15 (A. F. Gray); Cambridge, Mass. (Harris Coll.); Salem, Mass. (Emerton); Albany, N. Y., September 8–19 (Lintner); New Jersey (Sachs); Waterbury, Conn., September 20 (W. H. Patton); Plum Creek, Colo., September 22, 25 (Lieutenant Carpenter, Hayden's Survey).

This common moth is single brooded, not appearing until about the

middle of September, and flying until about the middle of October in the New England States. The larva is not uncommon, feeding on sedges, etc.

In coloration, the ten specimens collected by Lieutenant Carpenter do not differ from eastern ones: but on comparing them (5 ♂ and 5 ♀) with fifteen (10 ♂ and 5 ♀) specimens from Massachusetts, I find that the wings of the Colorado moths are uniformly more pointed toward the apex, the outer edge more oblique, and the wing narrower than in the eastern examples. The fore wing of the largest Colorado moth measured 0.95 inch in length, and that of the Massachusetts specimen 0.90 inch.

Larva.—Head of the same width as the prothoracic segment, divided by a slight median crease into two lobes. The body is cylindrical, of uniform width throughout, a little thicker over the first pair of abdominal feet: pale straw-yellow. Two subdorsal brown hair-lines, and two similar ones on the sides, interrupted by two, large, conspicuous, angular, black dots,—a pair on each ring. Beneath, three hair-lines on each side of the body. The head and pro-legs are dotted with black. Length, 1.50 inches. It feeds in Maine on *Carex Pennsylvanica*.

It has been found, August 1–14, in Danvers, Mass., by Mr. Gray, feeding upon the blackberry, wood-wax, wild indigo, etc., transforming into the pupa August 14, previously spinning a slight but well-formed web of yellow threads among the leaves.

Pupa.—Pale yellow, dotted slightly with black. Head well rounded; abdomen acute; wings reaching to near the hinder edge of the fourth abdominal ring; length, 0.68 inch. It remains in the pupa state from three to four weeks. For figures of the larva and pupa see plate 13.

HEMATOPIS Hübner. Plate 2, fig. 6.

Hematopsis Hübner, Verz., 301, 1818.

Geyer, Hübner, Zutr., 9, figs. 823, 824, 1837.

Guen., Phal., ii, 170, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1053, 1862.

Front of the head rather longer than broad; male antennae plumose, the branches very slender. Palpi slender, acute, projecting a little beyond the front. Fore wings long and rather narrow, much produced toward the apex, which is pointed but not falcate; costa straight, outer edge very oblique. Hind wings rounded at the apex, outer edge with a distinct bend; the inner angle reaches to the end of the abdomen. Venation: six subcostal

branches; a small, short subcostal cell; costal vein free from the subcostal, first subcostal very long, a third longer than the third. Apical area long and narrow. Independent vein situated midway between the last subcostal and first median branch. Coloration: deep ochreous, with two straight extradiscal pink lines.

The slender palpi, the long wings, with the oblique outer edge, the angulated hind wings, and unusual style of coloration will serve to render this genus, with its single species, readily recognizable.

HAMATOPIS GRATARIA Guenée. Plate 9, fig. 11.

"*Grametra grataria* Fabr., Suppl. Ent. Syst., 112, 113, 1798."

Hamatopsis sanitaria Hübn., Zutr., 26, 173, figs. 345, 346, before 1818; Verz., 391, 1818.

Hamatopsis grataria Guen., Phil., ii, 171, pl. 19, fig. 6, 1857.

Walk., List Lep. Hel. Br. Mus., xxiv, 1054, 1862.

Riley, First Rep. Ins. Missouri, 179, pl. 2, figs. 18-20, 1869.

12 specimens.—Body and wings ochreous-yellow, hind wings a little lighter. A large, round, pink, discal dot; beyond, two pink lines approaching each other on the costa; the inner forms a broad, diffuse band, but slightly curved opposite the discal dot; the second line is much narrower, parallel with the outer edge of wing, and more curved than the other. It is sometimes almost wanting, and occasionally blends with the inner line opposite the discal dot. Edge of wing and fringe pink. On hind wings, two pink bands, farther apart than on the fore wings; inner straight; outer line narrower and sinuate. Edge of wings and fringe pink. Under side brighter yellow than above, and dusted with brown scales, varying in thickness and size. Discal dot distinct, and two outer lines as above, but dusky pink; fringe bright pink; hind wing beneath as above, but flecked with brown spots.

Length of body, ♂, 0.40; of fore wing, ♂, 0.53, ♀, 0.50; expanse of wing, 1.00 inches.

Campton, N. H., June (Walker); Maine and Salem (Packard); Iowa ("May 30th, all summer, day and night, most abundant of moths" Parker); Albany, N. Y., June 9, September 24 (Lintner); Natick, Mass., "June 29" (Stratton); Middle States (Phil. Ent. Soc.); New York, May 25 (Lintner and Mesken); Albany, May 25 (Lintner); Texas (Beltinger).

Varies in breadth of inner band, in some being twice as wide as others, and in degree of irroration on under side of wings, and in breadth of band on edge of wing. Texas specimens do not differ from those from Maine.

It is at once known by being entirely ochre-yellow, and by the prominent pink discal spot and two extradiscal bands on both wings.

Larva.—Average length, 0.85. "Color quite variable, either pale yellowish-green, deep rufous with an orange tint, or of a mixture of gray and cream-color. Minutely punctate all over. Segments 1, 2, and 3, extremely short; 4, longest and widest, having two wrinkles each side, with a dark depression between them; 5, 6, 7, and 8, of equal length; 9, 10, and 11, short, the two former also somewhat wider than the other. Dorsum dark, with a lighter middle line, and a light, somewhat irregular, subdorsal line, which converges anteriorly and diverges posteriorly of each segment; two dark spots anteriorly each side of the middle line. Sides more or less wrinkled, lighter than dorsum, and with a light longitudinal ridge below. Venter variegated with longitudinal marks, and shaded outwardly with deep olive green, in strong contrast with the lateral light ridge. Stigmata minute, black, and placed on an oval swelling at the anterior portion of the segment. Head of the same color as body, with a dark line, edged each side with white, continuing from the thoracic segments.

Chrysalis.—Length, 0.50. "Wing-sheaths and tip of abdomen pale buff, the middle of the abdomen very light yellowish-green. A purplish dorsal line, obliquely truncated at the head, having a somewhat triangular appearance, the ventral angle being lengthened into a slightly bifurcate snout. Anal segments quite attenuated, the extremity being also slightly bifurcated. Stigmata small, black, and distinct.

"The female moths deposit their eggs in rows of about twenty, along the edge of a leaf, or along the stem of the common chickweed (*Stellaria media*). These eggs are not quite 0.02 of an inch long, and are oval, flattened, and depressed near the center. When first laid, they are yellowish-white, but change within two days to a very bright, shiny, red color, between venetian and vermilion. These eggs hatch in a very short time, frequently within a week, into thread-like worms, with ten legs only, and with the habit of looping themselves into all manner of shapes, especially into a circle.

"In about a month, during hot weather, they acquire their full size. They are quite variable in color, being either gray, yellowish-green, or dark brown. They change to chrysalids within a slight net attached to the leaves of their food-plant, and in this state the skin is so thin that before the moth escapes the colors of the wings show distinctly through it. There are several

broods during the year, and the insect may often be found in all its different states at one and the same time. It probably passes the winter in either the larva or egg state, for I have taken both eggs and half-grown larvae in the beginning of November.

"In the larva and chrysalis state it is not easily detected, on account of its small size and of its assimilating the color of the food-plant. The larva has furthermore the habit of jerking itself away to a considerable distance when disturbed, especially while it is young." Riley.

LYTHRIA Hübner. Plate 2, fig. 7.

Lythria Hübner, Verz., 300, 1818.

Aspilotes Treits. (in part), Schum. Eur., vi (i), 126, 1827.

Steph., Nomencl. Br. Ins., 41, 1829.

Dup. (in part), Lep. France, vii (vi), 110, 1830.

Boisd. (in part), Gen. Ind., 187, 1840.

Lythria Steph., Cat. Br. Lep., 300, 1850.

Lederer, Verh. Bot. Zool. Ges. Wien, 244, 1853.

Guen., Phal., ii, 171, 1857.

Walk., List. Lep. Het. Br. Mus., xxiv, 1054, 1862.

Front of head square; palpi slender, but more bushy than in *Hæmatopis*. Antennæ with long, sparse branches, not plumose. Fore wings rather long; costa well arched; apex not so much produced as in *Hæmatopis*. Apex pointed, outer edge less oblique than in *Hæmatopis*. Hind wings with a slight bend; scarcely extending as far as the end of the abdomen, which is long and slender in the male. Venation: costal vein anastomosing with the subcostal in the middle of the subcostal cell, the latter situated entirely or partly beyond the discal venules. Three very short, subcostal veins are thrown off to the costa. Lower discal venule very oblique. Coloration: red and brown, with blackish patches.

In this genus, the bushy palpi, square front, thinly-branched antennæ and high colors are distinguishing marks. It approaches *Fidonia* more sensibly than *Hæmatopis*.

Synopsis of the Species.

Fore wings not bent; three lines inequidistant; hind wings beneath ash-brown.....*L. rilevaria*.

Fore wings angulated; three lines equidistant; a black patch in middle of outer fourth

of wing; hind wings beneath orange.....*L. suaviaria*.

LYTHRIA RILEVARIA, *sp. nov.* Plate 9, fig. 43.

2 ♂.—Antennæ well but thinly pectinated, the branches much as in the European *L. plumularia*, but shorter. Palpi long, projecting far beyond the

front, not hairy. Fore wings more similar in shape to *L. plumularia*, being produced and pointed at the apex, with no angle in the outer margin as in *L. snoviaria*, but the whole wing is shaped much as in *L. plumularia*; the hind wings are full on the outer edge and distinctly angulated. Body and fore wings ash-brown, the latter brownish-ash on the inner two-thirds, a rich brown externally beyond the outer straight line. Fore wings crossed by three brown lines: the inner curved outward; the middle straight and much nearer the third than the basal line; third line very straight and firm, not wavy. Beyond this, the wing is coffee-brown (the color of crushed burnt coffee). Fringe concolorous with the outer third of the wing. Hind wings deep reddish-orange, unspotted, mottled with light and black scales on the inner edge, especially toward the internal angle. Fringe brown. Beneath, fore wings orange, light ash-brown, speckled with fine black strigæ on the costa and apical portion of the wings, extending to the inner angle. Hind wings uniformly light ash-brown, speckled with black, concolorous with the dark portions of the front wings. A slight discal spot and an outer slightly bent distinct dark-brown line. Fringe on fore wings checkered with brown, uniformly pale on hind wings. Legs short, concolorous with under side of hind wings.

Length of body, ♂, 0.35; of fore wings, ♂, 0.40; expanse of wings, 0.80 inch.

Central Missouri (Riley); Dallas, Texas, in April and again in July to September, on *Gleditsia* (Boll.).

This interesting species is dedicated to Prof. C. V. Riley, State Entomologist of Missouri. It may be recognized by the immaculate coffee-brown fore wings, with three inequidistant lines, the outer straight and merged with the coffee brown border. The hind wings are a little deeper-toned than in *L. snoviaria*.

LYTHRIA SNOVIARIA, *nov. sp.* Plate 9, fig. 42.

Fore wings rather broad; hind wings distinctly angulated. Head and thorax (abdomen wanting) and fore wings reddish-brown. Fore wings with three deep-red, parallel lines: the basal nearly straight, somewhat bent on the costa, the middle line slightly bent below the costa, and the third line a little bent in the discal space. Just beyond the bend, a large, conspicuous,

black patch with a faint shade extending to the inner edge and to the costal edge. The costa is edged narrowly with black, alternating with whitish. Beyond the third line, the wing is rather darker than within, being dull brick-red; the fringe is blackish-brown, faintly checkered with a lighter shade. Hind wings bright deep orange, with a black spot on the inner angle, and a linear black discoloration in the middle of the inner edge. Beneath, both wings uniformly deep orange, with dark strigæ on the extreme edge of the costa, a few faint strigæ toward the apical portion of the wing, but no lines. Fringe black, checkered with brown. Hind wings more strigated than anterior pair, with a single reddish, extradiscal line. No discal dots. Legs dark, ringed with pale reddish.

Length of body, 1—; of fore wing, 0.45; expanse of wings, 0.96 inch.

Lawrence, Kans. (Snow).

This beautiful species differs from *Lythria viceraria* in the broader, more angulated fore wings, the equidistant lines, and the large black patch in the middle of the wing near the outer edge, in the internal angle of the hind wings, and by the bright-orange hind wings. This species is named after my friend Prof. F. H. Snow of the University of Kansas, who has done much to develop a knowledge of the entomology of Kansas.

LOXOFIDONIA,* *gen. nov.* Plate 2, fig. 8.

Front of the head of the usual width, no narrower than usual, moderately convex. Palpi very long, projecting over half their length beyond the front; they are long and narrow, and seen sideways somewhat spindle-shaped; the third joint is long and narrow. Antennæ of male plump, being intermediate in the length of the branches between *Euphonia* and *Ematurga*. Fore wings with the costal edge arched much more than usual, the apex much produced, not acutely so, however, while the outer edge is very oblique, rather more so than in *Perconia*. Hind wings much produced toward the apex, with the outer edge full and rounded; the form of the wing is intermediate between *Ematurga* and *Perconia*. The venation differs entirely from *Ematurga* or *Euphonia*, and is more like that of *Perconia* in its general features. The subcostal areole is formed in the usual way, there being six subcostal branches; the areole is small, short, broadly triangular,

* *costa*, oblique; *Fidonia*.

The subcostal venules are long, the first one twice as long as the third. The independent vein is much nearer the sixth subcostal than usual, and the posterior discal venule is very oblique. Hind legs long, tibiae long, slightly swollen, tarsi nearly as long as the hind legs. Abdomen long and slender, much as in *Eufidonia*. Coloration bright deep ochreous, with transverse, wavy, curved, darker lines.

This remarkable genus differs from *Fidonia*, *Eufidonia*, and the allied forms mentioned above, by those characters of the wings which would cause it to be mistaken for an *Acidalia*; the venation is remarkably like *Acidalia*, being like that genus in all the points above noticed in which it differs from its allies; the form of the fore wing is also much like *Acidalia*, the costa being full and the outer edge very oblique. The hind wings are in form more like *Eufidonia* than *Acidalia*. On examination of the head, the very large palpi, and the body, it is quite different from *Acidalia* and like *Eufidonia*, except that the palpi are much longer. It is the most remarkable case of mimicry of a higher form I have yet met with in this family.

LOXOFIDONIA ACIDALIATA Packard. Plate 9, fig. 44.

Fidonia acidaliata Pack., Sixth Rep. Peab. Acad. Sc., 48, 1874.

6 ♂ and 2 ♀.—This singular form would at first be mistaken for an *Acidalia*. In the cut of the wings, it resembles *Ematurga atomaria* of Europe and our *Ematurgau faxonii*, but differs from the species of that genus in the long slender palpi and the slightly-pectinated antennæ. Its palpi are much longer than in *Fidonia truncataria*, and the wings, especially the hinder pair, much more produced. The palpi reach beyond the head a distance equal to the length of the latter. The male antennæ have long slender pectinations, about twice as long as in *F. truncataria* Walker. Body and wings deep brownish-ochreous, the wings with dark-brown scalloped lines, both pairs concolorous and with similar markings. Fore wings with about eight wavy lines, the basal angulated on the costa, and remote from the second. The second and fifth broader and heavier than the others (inclosing three fine lines), both angulated a little below the subcostal vein, the fifth a little sinuous and scalloped. The fifth and sixth separated by a distance equal to the width of the abdomen. The seventh and eighth submarginal approximate, finely waved. The eighth sometimes lost in a dark margin. Fringe dark

brown, a faint discal dot. Hind wings marked as fore wings, but with no discal dot or lines within the middle of the wing. Beneath of the same color as above, but rather clearer ochreous, with discal dots on both wings. Fore wings with two costal brown spots. No inner lines, the outer extradiscal line on outer third of wing broad and sinuous, with another fainter line midway between it and the edge of the wing. On the hind wings, the extradiscal line is broadly angulated in the middle of the wing, with a fainter line midway between it and the outer edge of the wing.

Length of body, ♂, 0.45, ♀, 0.42; of fore wings, ♂, 0.57, ♀, 0.46; expanse of wings, 1.10 inches.

Mountains of Colorado, August 12-29 (Lieut. W. L. Carpenter); twelve miles below Montezuma, Colo., on Snake River, Middle Park, elevation of 9,000 or 10,000 feet, August 7 (T. L. Mead).

LETHONIA, *gen. nov.*—Plate 2, fig. 9

Ephrasia Walk., in part, List Lep. Het. Br. Mus., xxi, 107, 1860.

Fidonia Walk., in part, List Lep. Het. Br. Mus., xxiv, 1031, 1862.

Minot, Proc. Bost. Soc. Nat. Hist., 83, 1869.

Front of the head rather full, the clypeus being full, much more convex than in *Fidonia* or *Perconia*, but hardly more so than in *Ematurga*. Palpi unusually short, scarcely projecting beyond the front, the third joint minute. Antennae with longer pectinations than in *Fidonia*; in female simple. Fore wings triangular, much as in *Ematurga*, the outer edge being less oblique than in *Fidonia*. Hind wings produced a little toward the apex, somewhat as in *Ematurga*, but not scalloped or square and sinuous as in *Fidonia*. The venation of this genus is remarkable: there being six instead of five subcostal venules, as in *Fidonia* and *Ematurga*. The first subcostal venule is one-fourth the length of the wing, and is free; the second subcostal unites with the subcostal vein at the origin of the fifth subcostal, forming a short broad cell. Otherwise, the venation is as usual. Hind legs with long stout tibiae and short tarsi, about half as long as the tibiae. Coloration much as in *Ematurga*, but the ground-color is white. The single species known is of moderate size, much larger than those of *Fidonia* and smaller than *Ematurga*.

This genus, which very nearly approaches *Ematurga* in the form of the wing, and also closely resembles *Fidonia*, differs from both in the presence of six instead of five subcostal venules, the first being long and free. In the

allied genera and in the family usually, the first subcostal vein is concerned in the formation of the subcostal areole. It also differs in the long, somewhat swollen hind tibiae, and the unusually short, rather stout tarsi. I do not know of any allied European species. The larva is not known.

EUFIDONIA NOTATARIA Packard. Plate 9, fig. 47.

Euphrosia notataria Walk. !!!, Lep. Het. Br. Mus., xxi, 407, 1860.

Fidonia discospilata Walk. !!!, Lep. Het. Br. Mus., xxiv, 1034, 1862.

Larentia ? fidoniata Walk. !!!, Lep. Het. Br. Mus., xxiv, 1183, 1862.

Fidonia bicoloraria Minot, Proc. Bost. Soc. Nat. Hist., 83, 1869.

Fidonia quadripunctata Morrison, Proc. Bost. Soc. Nat. Hist., xvi, 1871.

10 ♂ and 10 ♀.—Antennae well pectinated, though less so than in *F. finetaria*, but more so than in *F. truncataria*. Fore wings a little produced toward the apex, the outer edge either rather long and oblique, curving regularly, or bent a little in the middle. Hind wings produced toward the apex, much more so than in the group of the genus to which *truncataria* belongs. Body and wings white, tinged on the veins with ochreous, and speckled and banded with rust-brown. Antennae dark, finely peppered with white scales. Head brown, orbits and palpi white; thorax brown and white. Fore wings whitish at base; beyond, a broad diffuse brown band as wide as the thorax (often broken up and represented by scattered spots and patches). Beyond, an equally broad white band, with scattered brown specks, and inclosing the large, round, discal spot. A broad extradiscal band (often narrow, irregular, and broken up) separated by a white band or line of varying width from the brown margin of the wing. Fringe smoky-brown, with narrow white checks. Hind wings white, usually less densely speckled and banded than the anterior pair, sometimes with three irregular brown bands, two beyond the large round discal dot; a marginal brown line (these lines often effaced, and the wing with scattered dots and scales, showing no disposition to be arranged into lines). The marginal band is sometimes wanting; the usual marginal row of linear, nearly connected, dark spots is always present. Fringe white, with faintly marked checks. Beneath, the wings are whiter and more ochreous than above, but with the bands and spots repeated nearly as distinctly as above. The extradiscal line is often most distinct on the inside, while the submarginal white line is obsolete, the wing being flecked with brown on the outer third. Abdomen and legs whitish.

Length of body, ♂, 0.36–0.48, ♀, 0.40; of fore wing, ♂, 0.45–0.60, ♀, 0.48; expanse of wings, 0.95–1.15 inches.

Brunswick, Me., common in dry pine woods and open fields with scattered pine-bushes, from the 10th of June until early in July, in company with *Ematurga Faxonii* and *E. truncataria*. About Boston and in Albany, N. Y., from June 1 to 15 (Morrison). Its flight is rather weak and vacillating.

Portland, Me. (Morse); London, Canada (Saunders); Dublin, N. H. (Leonard, Harris Coll. Bost. Soc. Nat. Hist.); Roxbury, Mass., May (Angus); Boston, Mass. (Minot and Sanborn, Mus. Bost. Soc. Nat. Hist.); Amherst, Mass. (Goodell); Albany, N. Y., May 25 to June 12 (Lintner and Morrison); Anticosti Island, Gulf of St. Lawrence (Coll. H. Edwards); "St. Martin's Falls, Albany River, Hudson's Bay Terr." (Walker).

This common and easily recognized species differs from all the others of the genus by the white ground color of the body and wings. It seems to be common in the Northeastern States. It is easily divided into two forms: *a*, small, and with short wings, the *Tephrosia notataria* of Walker and *E. quadri-punctata* of Morrison; and, *b*, *fidoniata*, a form with long wings, the outer edge not bent, rather long, and the wings less heavily banded and spotted with brown; but there are individuals before me which differ in these respects, and indicate two interesting races, which show signs of intermingling. It should also be observed that I have taken both races in the same field and on the same days. In the markings, it varies much as do all the species of the genus. In some specimens of variety *fidoniata* (Minot's *bicoloraria*) there are no bands, and the wings beneath are free from large spots and bands, with only scattered brownish scales. Sometimes, on each side of the discal spot on the fore wings, there is a dark brown line much deeper in tone than the brown shade which it limits. Rarely, the hind wing is densely mottled with brown. The four large, round, equal, discal dots are always distinct, and farther separate the species from its allies.

PERCONIA Hübner. Plate 2, fig. 10.

Perconia Hübn. (in part), Verz., 236, 1818.

Fidonia Treits (in part), Schm. Ent., vi (1), 262, 1827.

H. Sch. (in part), Schm. Ent., iii, 81, 1847.

Lederer (in part), Verh. Bot. Zool. Ges. Wien, 229, 1853.

Guen. (in part), Feald., ii, 151, 1857.

Walk. (in part), List Lep. Het. Br. Mus., xxiv, 1031, 1862.

Head with the clypeus not very full, as in *Fidonia*, or raised into a square area bounded by a ridge, with a large, sharp, narrow-toothed, mesial carina projecting beyond the scales. Palpi long, broad, porrect, extending half their

length beyond the front. Antennae with short pectinations, much as in *Fidonia*; in female simple. Fore wings unusually long; the costa straight, a little sinuous; apex much rounded; outer edge very oblique and convex, much more so than usual. Hind wings unusually long; the apex continuously rounded, with a very full, rounded, outer edge. Venation somewhat as in *Ematurga*, but the subcostal areole is much shorter and broader, and the first two subcostal venules are shorter, less obliquely directed to the costal edge. The arrangement of the discal venules much as in *Ematurga*. Hind legs with the tibiae considerably swollen, and the tarsi nearly as long as the tibiae. Coloration pale-brown above, with the under side of the hind wings beautifully checkered and marbled with silvery-white and greenish-ochreous.

This and the European *P. fasciolaria* Hübner differ from *Fidonia* in the longer, more rounded fore wings, the apex being a little upturned, in the long and much rounded hind wings, and singular mode of coloration. The singular median crest on the head of our *P. fimetaria* is wanting in its closely-allied European species *fasciolaria*, and there is nothing like it in any other species of *Fidonia* and allies known to me. I restrict Hübner's name *Perconia* to this and its European ally, *fasciolaria*; Hübner's *Perconia* is equivalent to Treitschke's *Fidonia*, and has been hitherto strangely ignored. The female differs from the male in the hind wings being a little more produced. The larva of neither *fasciolaria* (*cebraria*) nor *fimetaria* is known.

PERCONIA FIMETARIA Packard. Plate 9, fig. 45.

Fidonia fimetaria Grote and Robinson, Trans. Amer. Ent. Soc., vi, 1871, pl. ii, figs. 84, 85, 86, 1870.
Fidonia hahsaria Zeller, Verh. K. K. Zool. Bot. Ges. Wien, xxii, 188, 1872.

10 ♂ and 1 ♀.—Male antennae broadly pectinated; the female pectinations nearly as long as those of the male European *fasciolaria*; fore wings rounded at the apex, and the inner angle rounded, not angular, as in *F. truncataria*. The hind wings narrower and more rounded externally than in *truncataria*, or its European representative *P. fasciolaria*, and less produced toward the apex than in the latter species, and with a less distinct notch in the outer edge. Body and wings of a peculiar, rich, ochreous, tan-brown, with ochreous markings. Head and palpi ochreous, with brown scales. Antennae concolorous with the body and wings. Both pairs of wings of the same hue; fore wings ochreous along the basal third of the costa; just beyond the middle, a large, oblong, costal, ochreous patch; just before the apex, an ochreous, costal spot, reaching nearly to the independent vein. Below the apex, two or

three marginal ochreous spots. Fringe on both wings ochreous, checked narrowly with brown. Hind wings with traces of the three bands of the under side. Body beneath and legs ochreous. Fore wings brown, with the costa marked as above, with about five marginal, ochreous, oval spots along the outer edge. Hind wings gayly banded with bright ochreous and silvery white. At the base, a linear, oval, silvery spot parallel to the costa, the latter being silvery, interrupted by an ochreous-brown spot. Beyond, the wing is crossed by three silvery-ochreous bands, varying in width, and often broken up into spots; the outer row consisting of about six large, oval, contiguous spots. Fringe broadly checkered with brown.

Length of body, ♂, 0.35, ♀, 0.34; of fore wings, ♂, 0.42, ♀, 0.45; expanse of wings, 0.90–0.92 inch.

Waco, Texas, June 6, August 18 (Belfrage, Mus. Peab. Acad. Sc.; Dallas, Texas, May 15, "flying on the prairies" (Boll., Mus. Peab. Acad. Sc.). There are apparently two broods.

In the female, the wings are a little longer; the apex of the fore wings much more produced than in the male. This beautiful species may be recognized by the peculiar ochreous, tan-brown color, the two square, costal, ochreous spots, the gaily-colored under side of the hind wings, the three silvery-ochreous bands being faintly reproduced above, and by the broadly-pectinated antennae. It differs from the European *P. fasciolaria*, which it represents in North America, in the broadly-pectinated male and narrowly-pectinated female antennae. In the female *P. fasciolaria*, the antennae are simple. The wings are also less produced, the hinder pair less notched on the outer edge, and in no specimens yet seen are the costal spots continued across the wing, sometimes forming regular bands, as in its European representative. It varies but slightly; in one case, the wings are suffused slightly with ochreous, and the female is rather more ochreous than the male.

EPIDONIA Treitschke. Plate 2, fig. 11.

Proconia Hubn. (in part), Verz., 296, 1846.

Eidonia Treits. (in part), Schim. Ent., vi (ii), 262, 1827.

H. Sch. (in part), Schim. Ent., iii, 81, 1837.

Eupistonia Steph., Cat. Br. Lep., 157, 1859.

Eidonia Lederer (in part), Verh. Bot. Zool. Ges. Wien, 179, 1863.

Guen. (in part), Phal., ii, 151, 1857.

Walk. (in part), List Lep. Het. Br. Mus., xxiv, 1061, 1862.

Head with the front usually rather flat, not very full, usually only slightly convex. Palpi large and stout, sometimes projecting half their length beyond

the head: scales loose and long. Antennae moderately pectinated: the branches short and very slender, shorter than in *Perconia*: in female simple. Fore wings with the costa straight, a little sinuous, the apex a little more produced than in *Ematurga*: outer edge more oblique than in *Ematurga*. Hind wings with the outer edge full, slightly bent on the first median vein, and with a slight sinus below the apex, which is round, not produced as in *Ematurga* and *Perconia*. Venation much as in *Ematurga*, but the subcostal areole is open: the areole is, however, narrow and curved, as in *Ematurga*. The costal vein joins the areole either before the middle and unites with it to near the end, as in *F. truncataria*, or joins it (in *F. carbonaria* of Europe) much as in *Ematurga*, but a little beyond the middle. Hind legs as in *Ematurga*: the tibiae being slightly swollen, and the tarsi nearly as long as the tibiae. Coloration much as in *Ematurga*.

This genus, which I would restrict to *Fidonia truncataria* of this country and *F. carbonaria* and *F. concordaria* of Europe, differs from *Ematurga* in the subcostal areole being open, in the short branches of the antennae, and the more rounded hind wings. From *Perconia* it differs in the more pointed apex of the fore wings, and the shorter, squarer, hind wings, and the narrower costal area of the fore wings, with the narrow but open areole, and the flat clypeus. The species are of small size.

FIDONIA TRUNCATARIA Walker. Plate 9, fig. 46.

Fidonia truncataria Walk., Lep. Het. Br. Mus., xxiv, 1934, 1862

Fidonia tricoloraria Morrison.

♂ and ♀.—Antennae with pectinations less than half as long as in *P. jinetaria*. Fore wings more acute: apex rectangular, not rounded: hind wings a little produced toward the apex, and distinctly notched in the outer edge. Palpi much larger than in *P. jinetaria*, projecting well beyond the head. Body and wings deep rusty orange-ochreous as a ground-color. Head and palpi more red than the thorax. Fore wings with four, well-marked, black, irregular, equidistant bands: the basal one curved outward a little: the other three straight, though a little sinuous in their course: the two outer are edged externally with a whitish streak: a black linear marginal line. The spaces between the lines are marked with linear dots. The discal dot large and round sometimes confused with the transverse strigae and extradiscal band. Hind wings like the fore wings, with three broad, irregular, black

bands: the inner band bent outward in the middle; the middle band dislocated and thrown outward in the middle of the wing. Fringe on both wings dark brown; on the hind wings checkered faintly with pale ochreous. No discal dot on hind wings. Beneath, deep rusty orange-ochreous, with three dark bands. Whitish along the middle of the discal space and along the outside of the outer dark band, as well as along the inner edge of the wing, costa edged at intervals with black. On the hind wings, the bands are deep rust-red, edged with whitish; there are scattered black strigæ over both wings, and the fringe is as above.

Length of body, ♂, 0.35, ♀, 0.35; of fore wing, ♂, 0.42, ♀, 0.42; expanse of wings, 0.85 inch.

Brunswick, Me., not uncommon in dry pine-woods and adjoining fields, with *Eufidonia notataria* and *Ematurga Faronii*, May 28, July 4 (Packard, Mus. Peab. Acad. Sc.); Albany, N. Y., May 23 (Lintner and Morrison; Colorado Territory, "St. Martin's Falls, Albany River, H. B. T." (Walker), (Mead).

This well-marked species differs from any other, except *E. Faronii*, in its color being deep rust-red, with black-brown strigæ and bands. It is about half the size of *P. Faronii*. It is noticeable for the narrowly-pectinated antennæ, the long, large palpi, and the four conspicuous black bands on the fore wings. It does not vary much, the Colorado female specimen not differing from Maine males, except in the more bent and broken middle line on the hind wings. Structurally, it is nearly allied to *Eufidonia notataria*.

EMATURGA Lederer. Plate 2, fig. 12.

Peromia Hübn. (in part), Verz., 296, 1-15.

Fidonia Treits. (in part), Schm. Eur., vi (i), 262, 1-27.

H.-Sch. (in part), Schm. Eur., iii, 84, 1-17.

Ematurga Lederer, Verh. Bot. Zool. Ges. Wien, 231, 1-53.

Fidonia Guen. (in part), Phal., ii, 151, 1-57.

Walk. (in part), List Lep. Het. Br. Mus., xxiv, 1031, 1-62.

Thorax rather stout; abdomen short, not very slender, scarcely reaching to the inner angle. Head with a full front, more so than in *Fidonia*, the clypeus being more convex, with hairs projecting out from it as far as the ends of the palpi, which latter are rather stout and bushy, much as in *Fidonia*, but with longer hairs, projecting a third of their length beyond the front. Male antennæ plumose, with remarkably long pectinations, giving a bushy appearance to the antennæ. Female antennæ simple. Fore wings triangular,

costa straight, apex subrectangular, outer edge not very oblique, very slightly bent on the first median venule. Hind wings with the apex slightly produced, with the outer edge full, convex, and distinctly scalloped. The fore wings in the female have the outer edge more oblique, while the hind wings are less convex on the outer edge. The venation is very different from that of *Fidonia*, justifying the separation effected by Lederer from that genus; there are but two subcostal veins, of equal length. The subcostal areole is long, linear, curved. The costal vein unites with the subcostal in the middle of the areole. The apical cell is unusually large. The anterior discal vein is curved and directed inward toward the origin of the independent vein, while the posterior discal is long and oblique, not curved. Hind legs short, with tibiae slightly swollen; spurs long; tarsi nearly as long as the tibiae. Coloration brown; hind wings ochreous, with darker bands.

While this genus differs from *Fidonia* in the more bushy, plumose antennae and fuller front, these characters would seem artificial, but a glance at the venation shows that the separation is a natural one. Our *E. Faxoni* differs very slightly from the European *E. atomaria*, and the genus as thus constituted is well circumscribed.

EMATERGA FAXONI Packard. Plate 9, fig. 48.

Fidonia Faxoni Minot, Proc. Bost. Soc. Nat. Hist., ¹³~~17~~ 83, 1869.

5 ♂ and 3 ♀. - Body and wings dark ochreous rusty-brown. Antennae darker. Male fore wings with three dark, diffuse, indistinct bands, the basal curved, the middle and extradiscal much alike, and often converging on the inner edge. Along the extradiscal line, the wing is powdered more or less distinctly with white scales, and again along the submarginal dark line. Fringe concolorous with the wing, lighter or darker as the wing varies in hue. Hind wings dull orange or reddish-ochreous, thickly speckled with black, with three black bands, the middle one distinctly scalloped, the points extended along the veins. The outer line is merged with the broad brown border of the wing. Beneath, both wings alike deep ochreous, and crossed by three brown shades common to both wings, the outer one often ending in the middle of the wing near the independent vein, and also nearly obsolete on the hind wings. Legs concolorous with the under side of the body.

The females differ in having the wings a little more pointed, the hinder part especially having the apex acute and the outer edge straighter, much less

full and rounded than the males. The wings are thickly dusted with white scales, bordering the dark bands and checkering the fringe with white, with distinct but diffuse discal dots on both wings. Beneath, much white is mixed with the ochreous tint, and the three bands are very distinct.

Length of body, ♂, 0.42; ♀, 0.35; of fore wing, ♂, 0.58, ♀, 0.54; expanse of wings, 1.18 inches.

Brunswick, Me., frequently taken late in June and early in July in open pine-woods, flying in company with *Eupidonia notataria* (Packard, Mus. Peab. Acad. Sc.); Portland, Me. (Morse, Mus. Peab. Acad. Sc.); Boston, Mass. (Minot); Salem, Mass. (Pickering, Harris Coll. Mus. Bost. Soc. Nat. Hist.); Albany, N. Y., May 21 to June 7 (Lintner); Missouri (Riley).

This moth may be known by the dark ochreous-brown fore wings, the ochreous hind wings, with the three darker bands, as well as by the bushy plumose antennae. It differs from the European *Ematurga atomaria* in the wings being less mottled with white or ochreous; the females of the two species are much alike, but ours differs in the heavier outer band and lighter inner band on the hind wings, the outer submarginal band wanting beneath in *E. atomaria*. The sexes differ in this genus much more than in *Eidonia*. The females are much lighter, with white speckles and distincter bands than the males, and with quite differently-shaped hind wings. The specimen from Missouri is much whiter than usual in the spaces between the brown lines, both above and beneath. The larva of the European *E. atomaria* feeds on the *Lotus* and *Centaurea*.

DASYFIDONIA,* *gen. nov.* Plate 2, fig. 13.

Body unusually short and thick; abdomen short, not extending to the inner angle of the hind wings. Head rather full and convex in front. Palpi long, extending about one-third their length beyond the front, with very long dependent hairs; third joint rather long, obtuse at tip. Antennae in male with broad pectinations, not plumose, the branches not spreading as in *Ematurga*; in female simple. Fore wings much as in *Ematurga*, but the costa is more sinuous; outer edge slightly bent, much as in *Ematurga*. Hind wings much as in *Ematurga*, but the apex is inclined to be a little more rounded, and the outer edge more bent and more deeply scalloped. The venation differs from that of *Ematurga* in there being six instead of five

branches of the subcostal vein, otherwise it is much the same; the first three subcostal branches are, however, shorter and of equal length. The anterior discal vein is directed obliquely outward in a line with the posterior discal, while in *Ematurga* it is curved inward. The subcostal areole is alike in the two genera. Hind legs rather slender, the tarsi very long and slender, equaling the tibiae in length. Coloration somewhat as in *Ematurga*, but the fore wings tinged with ochreous above, and beneath bright orange, and the hind wings bright orange, but beneath ashy-brown, with two black distinct bands common to the two wings. This interesting genus is remarkable for its long hairy palpi, well pectinated antennae and bright colors, and differs from *Ematurga*, its nearest ally, in these characters and the presence of an additional subcostal venule. It seems to differ generically from *Fidonia fumula* Esper, to which it seems related by its style of coloration, judging by Duponchel's figures.

DASYFIDONIA AVUNCULARIA Packard. Plate 9, fig. 49.

Fidonia avuncularia Guen., Phal., ii, 155, 1857.

1 ♂ and 3 ♀.—Body very hairy. Male antennae with long pectinations; palpi very large and hairy, projecting farther beyond the front than the length of the head. Body blackish; fore wings ochreous-orange as a ground-color, but frosted heavily with white and discolored with black. Three heavy black lines, the basal not oblique, bent outward on the subcostal vein, with a large angle directed inward on the submedian space and outward on the internal vein. A diffuse middle line, much waved, double in the middle of the wing, the outer portion of the line running through the large (often indistinct) discal spot. The outer line is very sinuous: it is bent outward at right angles on the independent vein (the angle varying in sharpness), and is curved outward below the third median venule. A submarginal white shade, slightly sinuous, and well marked on the costa and inner edge of the wing. (This shade is sometimes entirely wanting.) The edge of the wing, especially toward the costa, is dark. Fringe blackish, checkered with white; on hind wings, white with black checks. Hind wings deep orange, more or less strigated with black, especially on the inner edge; outer edge of the wing bordered with black, with a whitish patch at the inner angle. The wings are crossed by two heavy dark lines, the inner sinuous, the outer making a well-marked angle on the independent vein. A conspicuous black

discal spot. Beneath, the fore wings are deep clear orange, with the border of the wing all around ash colored, speckled densely with black; costa whitish, with four black patches. Four large black patches on the inner border. Fringe heavily checkered with white and black, the black lines sometimes reproduced. A distinct discal dot. Hind wings pepper-and-salt colored, a little paler in the middle near the black discal spot. Under side of body and legs concolorous with hind wings.

Length of body, ♂, 0.45, ♀, 0.45; of fore wing, ♂, 0.55, ♀, 0.62; expanse of wings, 1.06–1.34 inches.

Nevada (Edwards): San Diego, Cal. (Crotch, Mus. Comp. Zool.).

Remarkable for its immense bushy palpi, in the plumose antennae and shape of wings it resembles *Ematurga Faxonii*. The hairy body, the blackish-ash fore wings, and bright reddish-orange hind wings and heavily-checkered fringe, and, beneath, the orange fore wings and pepper-and-salt hind wings, will separate it from any American species or any European form known to me.

It varies somewhat in the degree of predominance of the ochreous-orange ground-tint of the fore wings, in the presence or absence of the submarginal white shade of the fore wings, and the width of the black border of the hinder pair, this being sometimes reduced to a narrow black line. In one case, the discal dot is confused with the inner line on the hind wing.

ORTHOFIDONIA, *gen. nov.* Plate 2, fig. 11.

Male antennae not pectinated, but with heavy cilia; palpi rather bushy, not very slender, projecting well beyond the front, which is not so broad as long. Fore wings with the costa more convex than usual; apex rectangular, outer edge much less oblique than usual. Venation much as in *Scithosoma*, the costal vein anastomosing with the subcostal; no subcostal cell; second subcostal venule thrown off from the first; discal venules very oblique. Hind wings with an almost imperceptible angle. Male abdomen slender, not very long. Coloration much as in *Eufidonia notataria*, being white, with dark-brown flecks and spots.

The genus differs much from *Fidonia* in the ciliated antennae and rectangular apex of the fore wings, while the venation is like that of *Scithosoma*.

ORTHOEIDONIA EXORNATA Packard. Plate 9, fig. 50.

Exornata? exornata Walk., III, List Lep. Het. Br. Mus., xxiv, 1187, 1862.
Cidaria albifusata Walk., III, List Lep. Het. Br. Mus., xxiv, 1728, 1862.

1 ♂ and 3 ♀.—Male antennae ciliated, the hairs long, making the antennae look as if finely pectinated. Ground-color of body and wings ochreous-white. Fore wings speckled densely with dark reddish-brown (of the same hue as *Eufidonia notataria*). The fore wings are crossed by three irregular, indistinct bands, made up of dark reddish-brown patches, with lighter spaces between where the dark scales are less numerous. The basal band is nearly as broad as the body is thick; it is straight, diffuse, broken. The middle of the wing is clearer, though thickly speckled with dark scales; discal dot distinct. Just beyond, a broad, oblique, broken, diffuse band, interrupted by the ochreous veins. Beyond this is a clear, whitish band, forked on the subcostal vein, and sending an oblique whitish streak to the apex. A submarginal, white, scalloped line, the scallops filled with masses of brown, forming a row of rounded, conical spots. The margin of the wing is brown, with white flakes; a row of distinct, black, marginal spots. Fringe brown, white opposite the black marginal spots. Hind wings whiter than the anterior pair, the dark scales forming scattered dots, and also arranged in three extradiscal, diffuse, irregular bands, the submarginal one the most distinct, and edged externally with a white, scalloped line. A dark, interrupted, distinct, marginal, blackish line. Beneath, fore wings with the bands faintly re-appearing; the marginal spots on both wings as distinct as above. Hind wings with the brown spots and speckles more distinct than above; the middle of the three extradiscal bands is more distinct than the others. Discal dots distinct on both pairs of wings. Abdomen concolorous with the hind wings. Legs spotted and ringed with dark.

Length of body, ♂, 0.42, ♀, 0.42; of fore wing, ♂, 0.58, ♀, 0.58; expanse of wings, 1.20 inches.

Brunswick, Me., in pine-woods, June 16 (Packard, Mus. Peab. Acad. Sc.); sides of Mount Washington, N. H., early in July (Morrison); "Trenton Falls" (Walker).

Why this interesting moth should have been mistaken by Mr. Walker for either a *Laurentia* or a *Cidaria* I cannot understand, as it has the characteristic style of coloration of the *Fidonia*s, but with a more rectangular apex to the fore wings and ciliated male antennae. Otherwise, the markings resemble

those of *Eufidonia notataria* more than any other species, but the hind wings are more mottled with brown, and there are three distinct lines: it may also be identified by the forked, white, submarginal band sending one division to the costa and another to the apex. It seems to be rather infrequent, and has not yet occurred south of New England. It flies in the same localities with *Eufidonia notataria* as early as the middle of June in Maine, and for the rest of the month.

CARIPETA Walker. Plate 2, fig. 15.

Caripeta Walk., List Lep. Het. Br. Mus., xxvi, 1524, 1862.

Paranymphus Pack., New and little known Insects, Rep. Mass. Board Ag., 15, 1870.

Male antennae well pectinated, almost plumose; front rather narrow; vertex square. Palpi very short and thick, scarcely passing beyond the front. Fore wings with the costa straight; the apex slightly pointed; outer edge oblique; hind wings well rounded, the outer edge moderately full. Venation: costal vein anastomosing with the subcostal near the middle of the inner, small, lozenge-shaped subcostal cell; outer cell long and narrow; third subcostal branch very short, the apical cell being small. Discal venules transverse, not oblique. Abdomen unusually stout, not very long. The coloration is peculiar: the two species differing remarkably in this respect: in *C. divisaria*, the ground-color being white, with a broad, brown, median band; and in *C. angustiorata*, a rich, deep, yellow-ochreous, with white bands.

Synopsis of the Species.

White, with a brown, middle band, inclosing a large, white, discal spot *C. divisaria*.

Yellow-ochreous, with three white bands *C. angustiorata*.

CARIPETA DIVISARIA Walker. Plate 9, fig. 51.

Caripeta divisata Walk., List Lep. Het. Br. Mus., xxvi, 1525, 1862.

♂ and ♀.—Antennae moderately and closely pectinated, rather dark. Palpi not reaching as far as the front; fore wings with costa a little convex. Body and wings whitish-gray, peppered with fine dark scales. Fore wings dark at the base, being densely mottled with dark brown. A broad, middle, dark band nearly twice as wide on the costa as on the inner edge; it is black on the edges, lighter in the middle, with waved black strigae, and incloses a large, oblong, oval, white spot; on the inside, the band is curved inward toward the middle of the wing, and is sinuous in its course; it is bordered externally with a broad white band. The outer side of the mesial band is oblique, with deep, irregular scallops; there are three scallops on the costal

region; a deep, large scallop, with a projection, at the bottom of the sinus in the discal space; another larger sinus below the median vein. These scallops are filled in by a broad white band, the outer edge of which is either straight or a little sinuous. Beyond this white line, the margin of the wing is dark, often with a faint, submarginal, white, wavy line, the scallops of which are filled by obscure, dark patches. Fringe short, whitish, checkered with brown. Hind wings whitish-gray, sprinkled on the outer half with dark specks, sometimes with a dark, curved, sinuous shade just beyond the middle of the wing. Beneath, both wings are pale-ochreous, including the veins, and dusted with black scales. The medial shade and discal spot are faintly reproduced; the edge of the wing is clear, with a broad, diffuse, submarginal shade; the outer edge of the mesial band is black and linear on the costa. Hind wings dusted more than the anterior pair, with a deeply-scalloped black line, with a whitish shade beyond. Legs ochreous-gray.

Length of body, ♂, 0.50, ♀, 0.54; of fore wing, ♂, 0.70, ♀, 0.75; expanse of wings, 1.55 inches.

Mount Washington, N. H., July 7 (Saulborn); Brunswick, Me., in dry pine-woods, July 8-10, not uncommon (Packard); Williamstown, Mass. (Scudder); Scobarie, N. Y., July 26 (Lintner); Florida (Clemens); "Nova Scotia, New York" (Walker).

This fine moth may be recognized by the nearly white ground-color of the wings, with the broad, mesial, blackish, mottled band, darker on the edges, bordered on each side with a broad white band, and inclosing a large, oblong, oval, white, discal spot. It differs so much from *C. angustioraria* that it would scarcely be referred to the same genus.

It does not vary much, except in the presence or absence of the outer sinuous shade of the hind wings, and the degree in which the wings are speckled with dark scales. The Floridan example, though in bad condition, does not differ from northern ones, except that the margin of the wing is clearer and the adjoining white band wider. This is quite a different species from *C. latiorata* Walk., from East Florida, the type of which I saw in the British Museum.

CARPETA ANGUSTIORARIA Walker. Plate 9, fig. 52.

Caripeta angustiorata Walk.!!!, List Lep. Het. Br. Mus., xxvi, 1521, 1862.

Paranomos pinaria Pack., New and Little Known Insects, Rep. Mass. Ag., 15, 1870.

4 ♂.—The head, antennae, and thorax are pale-ochreous, the antennae

of the male being furnished with short, thick pectinations; the palpi are short, not passing beyond the front of the head, with the third joint short and minute. The fore wings are opaque, deep-ochreous, and paler at base; on the inner fourth is a white line forming a single, large, and acute angle on the median vein, along which it is prolonged beyond the basal third of the wing, extending out nearly as far as the discal dot, though situated below it. There is a large, irregular, silvery-white discal dot, and just beyond, a broad silvery line diffuse on the outside; it curves inward just below the median vein, and slightly inward opposite the discal dot. Half-way between this line and the outer edge of the wing is a row of irregular white spots, from which sometimes run whitish streaks to the fringe, which, between the white spots, is ochreous-brown. These markings show through faintly on the under side. The hind wings are pale whitish ochreous above; beneath, washed with yellow-ochreous upon and on each side of the venules. The costal area is yellowish. A light shade beyond the round, whitish, discal dot. The legs are pale, concolorous with the upper side of the hind wings.

Length of body, σ , 0.58; of fore wing, σ , 0.72; expanse of wings, σ 1.60 inches.

Norway, Me. (Smith, Mus. Comp. Zool.); Boston (Minot); "Nova Scotia" (Walker).

This fine moth differs remarkably from any Geometrid we have, in the opaque, rich, velvety-ochreous fore wings, with the three broad silvery lines and large oblong discal dot. It is very unlike in style of coloration the two other species of the genus, and would scarcely, at the first glance, be referred to the same genus as *C. dirisaria*.

Desideratum.

Curipeta latiorata Walk., List Lep. Het. Br. Mus., xxv, 1525, 1862.—
"Male. Fawn-color, mostly cinereous beneath. Wings minutely black-speckled. Fore wings brownish, excepting the costa, with white markings, which consist of a round discal, an irregular discal stripe, and two irregular exterior bands. Hind wings without markings. Length of the body 8 lines; of the wings 20 lines.

"East Florida. Presented by E. Doubleday, esq."

I saw Walker's type-specimen in the British Museum: it is quite distinct and new to me.

SELILOSEMA Lederer. Plate 2, fig. 16.

Fidonia Treits. (in part), Schim. Eur., vi (i), 262, 1827.

Dup. (in part), Lep. France, vii (iv), 407, 1829.

Borsd. (in part), Gen. Ind., 190, 1840.

Fidonia and *Boarmia* H.-Sch. (in part), Schim. Eur., iii, 76, 84, 1847.

Fidonia Steph. (in part), Cat. Brit. Lep., 158, 1859.

Selidosoma Lederer, Verh. Bot. Zool. Ges. Wien, 232, 1853.

Guen., Phal., ii, 145, 1857.

Walk., List Lep. Het. Br. Mus., xxv, 1026, 1862.

Body rather stout. Male abdomen long and slender, tip with spreading hairs. Head of moderate size. Palpi very long and slender, porrect, sometimes extending beyond the head by a distance as great as the length of the head; third joint nearly as long as the second. A pointed tuft of short hairs between the palpi. Antennæ with unusually long pectinations, the tip suddenly simple. Fore wings acute, tip pointed and square, or a little rounded; costa arched a little, slightly sinuous; outer edge convex, not angled. Hind wings a little produced toward the apex, the outer edge not very convex, slightly scalloped. Venation much as in *Ematurga*, but the subcostal venules are much shorter, and there are three subcostal veins instead of two, the second and third very short and equal in length. There is no subcostal areole, the first subcostal not joining its main vein again, as in *Ematurga* and *Lozogramma*. The discal veins are as in *Ematurga*. Hind legs very long and slender; hind tibiae long, not swollen; tibiae as long as the tarsi. Coloration light ochreous-gray, irrorated with brown, with a single incomplete extra-discal line.

These characters have been drawn up from *S. juturnaria* and the European *erictaria* (*plumaria*) alone. The Californian species has more pointed wings than the European, while the latter has very short palpi, but the pectinations of the antennæ are twice as long as in the other species, and the hind tibiae are shorter and thicker. It need not be confounded with *Bupalus* or *Fidonia*, or its allied forms *Ematurga*, &c. It has the body of *Lozogramma* and *Thamnonoma*, but differs from them in the plumose antennæ. The venation I do not regard as like *Cymatophora* (*Boarmia*), as stated by Lederer. The species are of large size.

Larva.—"Caterpillars cylindrical, neither attenuated nor carinated; without any tubercles; head globular; living on low plants. Chrysalides subterranean."—Guenée.

SELIDOSEMA JUTURNARIA Guenee. — Plate 9, fig. 53

Selidosema juturnaria Guenee, Phala. n. 117, pl. 15, fig. 5, 1857.

Walker, List Lep. Het. Br. Mus., xxix, 1029, 1862.

Pack., Proc. Bost. Soc. Nat. Hist., xiii, 391, 1871.

Selidosema californiaria Pack., Proc. Bost. Soc. Nat. Hist., xiii, 391, 1871.

1 ♂ and 1 ♀.—In a male received from Mr. Behrens, the wings are clearer, the outer line less distinct; the dusky cloud near the internal angle of the wing is wanting, and the fringe is slightly checkered as in the female; the hind wings are crossed on the under side by a well-marked curved band of large brown spots, and the under side is of a paler ashen-gray than in the other specimens.

The male differs from the female in the fore wings being clearer beyond the outer broad band, and in not having the large dark patch below the middle of the wing (present in the male), while the outer edge of the hind wings is clearer; but it differs most in having the fringe checkered with white and dusky-brown. A faint band on the under side of the hind wings, sometimes not present in either sex. A variety, originally described as a distinct species, is *californiaria*. It is usually pale-ash, bathed on the fringe and beneath with reddish-pink; the palpi are longer and scales of front rougher than in *S. juturnaria*, otherwise it is structurally the same, though larger. Fore wings crossed by a single curved, diffuse, dusky line, beginning on the outer third of costa, and curving and fading away before reaching the inner edge; this slightly-marked line being more regularly curved than in *S. juturnaria*. No discal dot seen above. Hind wings free from markings, fringe pinkish, and both wings beneath bathed with reddish-pink. On fore wings, a linear, small, discal dot; on hind wings, a larger, rounded, discal dot. No band on hind wings, or any other markings or dusky scales, and on the fore wings is a faint reproduction of the single outer line, disappearing before reaching the middle of the wing.

It may be at once recognized by the red fringe and under side of wings.

Length of body, ♂, 0.65–0.70; fore wing, ♂, 0.75–0.86; expanse of wings, 1.60 inches.

Alaska (Behrens); Sanzalito, Cal. (Behrens); San Francisco, Cal. (A. Agassiz, Mus. Comp. Zoöl.).

LOZOGRAMMA Stephens. Plate 2, fig. 17, 17*a*, 17*b*.

Lithius Hübn. (in part), Verz., 338, 1818.

Aspilates Treits. (in part), vi (i), 126, 1827.

Lozogramma Steph., Nomencl., 44, 1829; "Cat., ii, 141, 1829."

Phasian Dnp. (in part), Lep. France, viii (v), 145, 1830.

Larentia Boisd. (in part), Gen. Ind., 204, 1840.

Lozogramma Steph., Cat. Brit. Lep., 183, 1850.

Panagra Guen. (in part), Phal., ii, 126, 1857.

Lozogramma Walk., List Lep. Het. Br. Mus., xxiii, 982, 1861.

Head with a rather narrow front, and with a few long scales forming an interpalpal tuft. Palpi ascending, the outer third or half of the second joint surpassing the front; third joint minute, short, or moderately long, pointed. Male antennae simple, compressed, ciliated beneath; in the female, simple and filiform. Thorax slender. Abdomen usually very long and slender, with a terminal tuft. Fore wings convex on the costa; apex acute, rectangular, sometimes very slightly falcate. Outer margin not very oblique, usually bent in the middle. The first subcostal vein free; the subcostal areole very narrow, linear, not curved as in *Thamnonoma*; the second and third subcostal veins nearly equal in length. The two discal venules run in a straight line across the wing, the posterior one being curved inward a little. Hind wings produced toward the apex, not bent on the outer edge. Legs very long; hind tibiae much swollen; spurs slender; hind tarsi a little more than half as long as the hind tibiae. Coloration: pale ash-brown or whitish; either without or with two transverse lines.

This genus differs from *Thamnonoma*, to which it is nearest allied by the simple flattened antennae and the longer legs. There is a parallelism between the two genera in the most characteristic form, *L. nigroseriata* having the wings much more falcate, the palpi longer, and the legs longer, while in the lower species, such as *L. disconventa* and *atropunctata*, the palpi and legs are shorter, and the wings are not at all falcate, there being the same range of variation as between *Thamnonoma waravia* and *T. tripunctaria*.

Synopsis of the Species.

A. Fore wings obtuse, outer margin rounded:

- Wings dark, mottled with brown; fore wings with a silver w. *L. disconventa*
 Wings pale whitish; outer line faint, consisting of dots.... *L. deersata*.

B. Fore wings acute, outer margin bent:

- Fore wings with outer line consisting of black dots *L. atropunctata*
 Fore wings with two broad, distinct, brown bands..... *L. defluata*.
 Larger than the others; fore wings falcate; pale tawny *L. nigroseriata*

LOZOGRAMMA DISCREPATA Packard. (Plate 9, fig. 56.)

Tephrosia discrepata Walk. Cat. Lep. Grote. List Lep. Hol. Br. Mus. 1: 143.

2 ♂ and 3 ♀.—Wings thin; apex of anterior pair much as in *T. detersata*.—Body and wing brown-ash, the latter mottled and speckled with ocherous-brown. Fore wings with an inner obscure curved line of dark brown spots. An outer slightly-curved line of obscure black dots. One or two dots on subcostal vein, with a silver-white point externally, and a silver Σ -like spot transverse to and in the middle of the wing. A broad dark shade from the costa, not quite reaching the apex, and fading out in the middle of the wing. A submarginal, pale, obscure band. A marginal row of black dots. Hind wings as anterior pair (paler in rubbed specimens), with the median row of black dots very near the middle and double along the middle of the wing. Under side of the wing paler than above, with the characteristic markings of the genus; a slight ochreous tinge on the costa, which is spotted with transverse black strigæ; rest of wing quite regularly speckled. An outer row of conspicuous, black, rather large, venular dots, common to both wings. Discal dots large, black; a marginal row of black dots. Fringe concolorous with the wing.

Length of body, ♂, 0.50, ♀, 0.40; of fore wing, ♂, 0.60, ♀, 0.60; expanse of wings, 1.25 inches.

Brunswick, Me. (Packard); Boston (Sanborn); Oneida, N. Y. (Hawley).

At once known by the transverse, w-shaped, silvery spot in the middle of the fore wings, and the pale under side with the row of conspicuous black dots.

LOZOGRAMMA DETERSATA Packard. (Plate 9, fig. 57.)

Tephrosia detersata Guen., Phala., ii, 105, 1857.

Walk., Cat. Lep. Hol. Br. Mus., xxiii, 259, 1861.

2 ♂ and 3 ♀.—Body and wings whitish, speckled very densely with dull ochreous. Head, palpi, antennæ, and front edge of prothorax ochreous. Fore wings uniformly speckled with ochreous, the specks becoming transverse on the costa. An inner faint line represented chiefly by ochreous spots on subcostal and submedian vein. A minute discal dot. An outer sinuate row of venular dots connected by a slight line, incurved below the median vein, with a wide ochreous-brown shade within. Beyond the line, the wing is more densely speckled (the spots almost contiguous) than within. A quite distinct, submarginal, slightly sinuate, broad, whitish line. A row of fine

marginal black points. Fringe not checkered, concolorous with rest of wing. Hind wing like fore wing, sometimes a faint median line of dots shaded within with pale ochreous, sometimes the wing is slightly paler than the fore pair. A marginal row of black dots. Beneath, tinged with ochreous, especially on the veins; wing speckled rather sparsely though regularly. An outer line of brown dots common to both wings. A submarginal brown line from costa to near middle of wing. Discal dots conspicuous, elongate on anterior pair. Fringe paler than wings beneath. Legs concolorous with the head.

Length of body, ♂, 0.50, ♀, 0.48; of fore wing, ♂, 0.62, ♀, 0.64; expanse of wings, 1.30 inches.

Brunswick, Me., June 16; Orono, Me., June and July (Packard); Cambridge, Mass. (Harris Coll.); Boston, Mass. (Sanborn); West Farms, N. Y. (Angus); New Jersey (Sachs); Philadelphia, Pa. (Ent. Soc.).

This species may be known by the faint markings, the slightly-marked lines, and its pale shade; by the partial submarginal line on the under side of the fore wings and the whitish fringe. It varies in tint, one specimen from Maine being quite pale, whitish.

LOZOGRAMMA ATROPUNCTATA Packard. Plate 9, fig. 58.

Lozogramma atropunctata Pack., Sixth Rep. Peab. Acad. Sc., 50, 1874.

1 ♂ and 2 ♀.—Closely allied to *L. deterzata*, but apex of fore wings more acute, and outer edge somewhat bent; thus structurally it is nearer to *L. defluata*, but in the markings is nearer *L. deterzata*. Body and wings lilac-ash, with scattered black speckles. Head, palpi, and antennae with a reddish tinge. Fore wings with a curved, very irregular band, consisting of a few black scales, thickest on the median interspace; an outer, very slightly curved line of similar black dots, single toward the costa, the line inside shaded with brown, fading out toward the inner line, and not discoloring the costa. A faint discal black dot. Margin of wing beyond the outer line brown; apex clear lilac-ash. Hind wings just as fore wings; no inner line; outer line consisting of a single row of black dots. Fringe concolorous with the wing. Beneath, much as usual in the genus; the surface of both wings alike lilac-ash, and uniformly speckled with black veins, less ochreous than usual; discal dots black on both wings, sinuate on hind wings. Outer row of black dots common to both wings; wings slightly clearer outside of each dot. Legs

concolorous with the body. Abdomen with two black spots on the second segment.

Length of body, *♂*, *♀*, 0.50; of fore wing, *♂*, 0.53, *♀*, 0.62; expanse of wings, 1.25 inches.

Boston, June (Sanborn); Beverly, Mass., June 27 (Burgess); Salem, Mass. (Packard).

This pretty species is at once recognizable by the two rows of black specks and the peculiar lilac tint of the wings.

Lozogramma defluvia Walker. Plate 9, fig. 59.

Lozogramma defluvia Walk., List Lep. Brit. Mus., xxiii, 284, 1861.

4 *♂* and 12 *♀*.—Fore wings acutely pointed and distinctly bent on the outer edge. Body and wings pale lilac-ash. Head and palpi tinged with reddish; vertex concolorous with the rest of the head. Fore wings densely speckled with lilac-brown; two distinct, continuous, darker lines, the inner straight, fading out on inner side; the outer very slightly sinuous, narrow, pale, edged on each side with brown. Between the two lines paler than the outer border of the wing. A faint, very sinuous, submarginal line, easily overlooked. A pale line at base of fringe, which is concolorous with the dark margin of the wing. Hind wings paler than anterior pair; discal dot distinct, a slight brown line beyond. Beneath tinged with ochreous, especially on the costa and veins; with scattered speckles; discal spots large and distinct. Outer row of venular dots distinct; beyond, the wing is decidedly ochreous, but the fringe is pale lilac. Legs tinged with ochreous.

Length of body, *♂*, 0.52, *♀*, 0.50; of fore wing, *♂*, 0.65, *♀*, 0.62 inch.

Brunswick, Me., end of May and early June (Packard).

This species is very abundant in dry fields and open places in pine-woods, rising suddenly and flying with a powerful headlong flight, settling down again at a rod or two from where it started. It may be known by the two broad, brown, continuous shades crossing the fore wings, by the lilac tint of the wings, and the ochreous under side. It differs from the European *L. putraria*, to which it is closely allied, by the more speckled wings, acute tips, and more sinuate outer line. The other species of the genus seem peculiar to America.

This moth is so much like the European *L. putraria* that I reproduce Newman's description of the larva of that species, as that of *defluvia* should

be looked for in the same situation:—"The caterpillars, which emerge at the end of May, feed on the common brakes (*Pteris aquilina*). When full-fed their length is rather more than an inch: the ground colour of the back is olive green, of the belly paler; the white body is covered with slender chocolate-brown longitudinal lines arranged in pairs: there is a double medio-dorsal stripe, and three double stripes on each side, the lowest darkest and broadest. The spiracles are black, and below them is a creamy-white stripe."

LOZOGRAMMA NIGROSERIATA. Plate 9, fig. 60.

Lophosia nigroserrata Pack., Proc. Bost. Soc. Nat. Hist., xvi, 32, 1871.

5 ♂ and 1 ♀.—This is the largest species of the genus yet known from this country. The wings are decidedly falcate, the costa being convex and the apex acute. Body and wings pale ochreous, with a pale rusty hue. Fore wings with a basal curved series of discal dark dots, consisting usually of about five or six venular dots—one on the costal, two on the subcostal, and one on the median and internal vein each (sometimes connected, forming a wavy line). A broad, rusty-brown, straight shade crosses the wing at the origin of the first and second venules. A slightly-curved row of about nine venular black dots: just beyond, a faint rusty shade (sometimes connected and forming a wavy line). A marginal row of intervenular dots. Fringe pale, concolorous with the wing. Hind wings very slightly paler than the anterior pair, with an external row of about eight venular black dots. No discal dots to be seen above. Beneath, four large discal dots; the extradiscal forming a row of dots common to both wings. Under side concolorous with the upper side of the front wings, with fine scattered scales. Legs and abdomen concolorous with the wings.

Length of body, ♂, 0.55–0.72, ♀, 0.55; fore wings, ♂, 0.58–0.80, ♀, 0.65; expanse of wings, 1.20–1.50 inches.

Victoria, Vancouver's Island, July (Crotch, Mus. Comp. Zööl.); Sanzalito, Cal. (Behrens); California (Edwards).

This fine species differs from the others of the genus in its large size, the more convex costa, and falcate fore wings, and by the two rows of disconnected dots on the fore wings, sometimes represented by lines. The palpi are also a little longer than in the other species.

Certain small individuals from California differ so much at first sight from the Vancouver Island forms that they might be regarded as a different species. In two specimens of the same size, from Sanzalito (Behrens) and California (Edwards), the dots are connected, and form two distinct lines.

Desubrata

Lozogramma extremaria Walk., List Lep. Het. Br. Mus., xxiii, 984, 1861 (see plate 10, fig. 20).—“*Male*.—Reddish cinereous. Wings minutely blackish-speckled, with a brown discal point, and with an exterior line of brown points on the veins: these points are apparent only on the under side. Fore wings with a slight indication of an interior line, and with a distinct, almost straight, ferruginous, exterior line. Length of the body, $6\frac{1}{2}$ lines; of the wings, 17 lines. East Florida.” The figure is copied from Walker’s type in the British Museum.

Lozogramma subaquaria Walk., List Lep. Het. Br. Mus., xxiv, 1660, 1862.—“*Female*.—Whitish cinereous, minutely blackish-speckled, slightly ochraceous-tinged. Hind tibiae slightly incrassated. Wings with a slender, brown, marginal line; fringe interlined with brown. Fore wings acute, with two oblique whitish lines, which are diffusely brown-bordered on the inner side; interior line straight; exterior line very slightly undulating. Length of the body, $5\frac{1}{2}$ lines; of the wings, 16 lines. Canada.” In Mr. D’Urban’s collection.

EUFETCHIA, *gen. nov.* Plate 3, fig. 1.

Abraxas? Fitch, Trans. N. Y. Ag. Soc., vii, 1848.

Closely allied to the second section of *Thamnonoma*. Male antennae well pectinated to near the tip, the branches ciliated; in the female simple, unciliated. Palpi rather large, porrect, much as in *Thamnonoma*, passing about one-third their length beyond the front of the head; third joint small, acute. Fore wings subfalcate; the costa rather full, the outer edge slightly angled on the first median. Hind wings somewhat square, a slight sinus below the apex. The shape of the wings closely resembles *Thamnonoma*; the venation is also very similar, the costal vein joining the subcostal on the inner third of the subcostal areole; and beyond, the vein is equal in length to the two subcostal venules, the three venules being unusually equal in length. The subcostal areole is long, narrow, and curved, as in *Thamnonoma*. The origin of the discal venules is much as in *Thamnonoma brunneata*. The direction of the discal venules is different from *Thamnonoma*, the anterior vein being straight and directed inward a little obliquely, while the posterior one is oblique and not curved. In the first section of *Thamnonoma*, both veins follow a regular curved line, while the course they unitedly take in *T. brun-*

curva is straighter, but each vein is slightly curved. Legs as in *Thamnonoma*, being long and slender; hind tibiae scarcely swollen; the tarsi three-fourths as long as the tibiae. The male abdomen is rather stout, less slender than in *Thamnonoma*.

The only species known is ochreous-yellow, with an outer row of subhyaline patches common to both wings.

It closely resembles *Thamnonoma brunnicaria* in the form of the head, antennae, and palpi, and shape and venation of the wings, differing in the longer pectinations and stouter abdomen and mode of coloration.

This may be regarded as a mimetic form, as it imitates *Abraxas* of Europe (of which we have no species) in the mode of coloration and in the stout abdomen, and the colors of the larva, which probably caused it to be referred with doubt to *Abraxas* by Dr. Fitch, who says that it cannot be referred to *Abraxas*, this also being the opinion of Dr. Harris. I regard *Abraxas* as a synthetic genus, anticipating *Thamnonoma*. As Dr. Fitch was the first to make known this moth, and describe its transformations, I respectfully dedicate the genus to him.

ECFETCHIA RIBESARIA Packard. Plate 9, fig. 61.

Abraxas? ribesaria Fitch, Trans. N. Y. Ag. Soc., VII, 1848.

♂ and ♀.—This common moth may be readily recognized by the uniform yellow ochreous tint on body and wings, and by the submarginal row of smoke-colored spots common to both wings, the spots in the middle of each wing being large. On the fore wing is a discal dot, sometimes a row of spots running over it, with two costal spots.

Length of body, ♂, 0.50, ♀, 0.53; of fore wing, ♂, 0.67, ♀, 0.64; expanse of wings, 1.25–1.30 inches.

This moth is everywhere abundant in the Northern States, flying in gardens and resting on the leaves of the currant and other plants.

Larva.—Body smooth, cylindrical, of uniform width throughout; head as wide as the body, with four black spots; on each wing above four black spots, and five on each side, ground-color yellowish-white. It appears on the leaves of the currant as soon as they unfold in May, and attains its full size in July, transforming into brown pupae of the usual form just beneath the surface of the soil under the bush, the moth appearing early in July. It is represented on Plate 13, fig. 2.

THAMNONOMA Lederer. (Plate 3, fig. 2, 2*a*, 2*b*)

- Peponis* Hubn. (in part), Verh., 29, 1818.
Leptis Hubn. (in part), Verh., 29, 1818.
Leptis Tröts (in part), Schin. Eur., vi, 1, 265, 1847.
Sphegodes Curtis, Brit. Ent., 225, 1828.
Habro Guér. (in part), Lep. France, viii, iv, 409, 1829.
Leptis Guér. (in part), Lep. France, viii, iv, 407, 1829.
Gedania cephora Steph., Nomencl. Br. Ins., 44, 1829; ² Cat., ii, 126, 1829.³
Sphegodes Steph., Nomencl., 43, 1829.
Habro Boisd., Gen. Ind., 187, 1840.
Eupistonia Boisd. (in part), Gen. Ind., 192, 1840.
Paludaria H. Sch. (in part), Schin. Eur., iii, 88, 1847.
Sphegodes Steph. (in part), Cat. Br. Lep., 157, 1850.
Habro Steph., Cat. Br. Lep., 159, 1850.
Thamnonoma Lederer, Verh. Bot. Zool. Ges. Wien, 232, 1853.
Hadia Guér., Phal., ii, 91, 1857.
 Walk., List Lep. Het. Br. Mus., xxiii, 943, 1861.
Eupistonia Walk., List Lep. Het. Br. Mus., xxiv, 1040, 1862.

Male antennae well pectinated, in the less typical species (*subcessaria*) about half as long as usual; female antennae simple. Palpi very long, porrect, pointed, the third joint long and extending sometimes by a head's length beyond the front, or, as in *T. wararia* and *subcessaria*, they are short and not much longer than in *Semiiothisa*, the third joint being small and depressed. A long double tuft of hairs projects between the palpi. Fore wings very falcate, the apex produced, and the outer edge excavated below the apex, with a dark line bordering the excavation; the outer edge is full below the excavation. The costal region is considerably wider; the subcostal venules longer than in *Semiiothisa*; the first subcostal venule is about a fourth longer than the subcostal areole, which latter is long, narrow, and curvilinear, as in *Semiiothisa*, otherwise the venation is very similar to that of *Semiiothisa*. Hind wings in the male with a prominent angle in the outer wings, as distinct or more so than in any species of *Semiiothisa*; in *wararia* and *subcessaria* less distinctly angular, and much as in most of the species of *Semiiothisa*; in the female, the outer edge is bent, but not distinctly angular. The abdomen is much longer and slenderer than in *Semiiothisa*, and reaches to the inner angle of the hind wings. Legs much as in *Semiiothisa*, long and slender; hind tibiae long, not swollen, and with the four spaces as usual. The species are either clear ochreous-brown, with two distinct lines on the fore wings, or with markings similar to *Semiiothisa*.

This genus is recognized by the well-pectinated antennae and long palpi; the species differ but slightly from those of *Semiiothisa* in other points. In

³ *Hadia* was pre-occupied for a genus of Mollusca by Risso in 1825.

T. wararia and *subcessaria* the only difference of importance is the well-pectinated antennæ, and with this exception, if we regard the imagines alone, the two genera run into each other.

I regard the more typical species as *T. tripunctaria* and *marcescaria*; the former being the most unlike the others, having the palpi longer and the fore wings more falcate than in any other species. The genus may be divided into two sections:

- A. With very long, porrect palpi, broadly-pectinated antennæ, falcate, pointed fore wings, angular hind wings, and a long, slender male abdomen.
- B. Palpi blunt and short; antennæ with pectinations half as long as in section A, and with the fore wings scarcely falcate; the hind wings not angular, pointed, and the abdomen shorter and thicker, much as in *Scniothisa*. This is represented by *T. wararia*, *subcessaria*, *brunnearia*, and *argillaccaria*.

In *T. brunnearia*, *argillaccaria*, and *sulphuraria*, the subcostal areole is shorter and much wider than in *T. wararia*; the outer end of the cell being partially open in *brunnearia*, but closed, as usual, in *argillaccaria* and *sulphuraria*.

Synopsis of the Species.

- A. Male antennæ broadly pectinated; palpi very long; fore wings falcate:
 - Three conspicuous brown patches on the fore wings..... *T. tripunctaria*
 - Male antennæ less broadly pectinated; wings pale ash..... *T. marcescaria*.
- B. Fore wings subfalcate; male antennæ slightly pectinated; palpi short:
 - A broad submarginal yellowish line..... *T. guenearia*.
 - Like *wararia*, but with more broadly-pectinated male antennæ, with four well-marked lines; the outer second line on the fore wings less bent than in *wararia*. *T. 4-linaria*.
 - A medio-costal, conspicuous, dark spot extending to the discal space, and two other costal spots; wings dull whitish-ash..... *T. wararia*.
 - Like *wararia*, but whitish-ash..... *T. subcessaria*.
 - Ochreous-yellow, with large brown spots..... *T. sulphuraria*.
 - Yellow; wings more falcate than in *sulphuraria*, with four parallel lines..... *T. flavicaria*.
 - Uniformly light reddish-brown..... *T. brunnearia*.
 - Uniformly argillaceous..... *T. argillaccaria*.

THAMNOMMA TRIPUNCTARIA Packard. Plate 9, fig. 68.

Thamnomma tripunctaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 26, 1874.

2 ♂ and 2 ♀.—Antennæ with much longer pectinations than usual, being much longer than in *T. marcescaria*. Palpi as usual. Fore wings with the apex more produced than in *T. marcescaria*, being acutely falcate. Abdomen without the two rows of black dots present in *marcescaria*. Fore wings

uniform fawn-color; body and hind wings paler. — An inner, straight, brown line, edged externally with yellowish brown; outer line slightly sinuate. Discal dot large lanceolate-oval; two conspicuous dark spots midway between the outer line and the edge of the wing, one being subapical in position. Fringe on both wings a little darker than the wings themselves. — No markings on hind wings; no discal dot. — Beneath, a decided ochreous tinge; no lines, discal dots distinct on both wings; fringe considerably darker than the rest of the wing. — The female differs from the male in the lines being farther apart.

Length of body, ♂, 0.50, ♀, 0.50; of fore wing, ♂, 0.60, ♀, 0.66; expanse of wings, 1.10 inches.

Sausalito, Cal., August 7 (Behrens); California (Edwards); Yosemite, October 19 (T. L. Mead).

This species differs from *marcescens* Guen. in the much more pectinated antennae and the absence of lines on the under side of the wings, which, beneath, are clear ochreous, not speckled with dark scales; while the two spots with the discal spot arranged in a triangle give it a characteristic appearance.

THAMNOMOMA MARCESARIA Packard. — Plate 9, fig. 69

Halia marcesaria Guen., Phal., ii, 92, 1857.

Halia cineraria Pack., Proc. Ent. Soc. Nat. Hist., xii, 322, 1871.

6 ♂ and 6 ♀.—This is an ash-colored species, with slender pectinations; the fore wings distinctly falcate, and the hind wings more distinctly angled than in any other species of the genus. Certain individuals I had regarded as distinct, and described under the name *cineraria*; but the addition of more material from Mr. Behrens shows that they are not different from the true *marcesaria*. I append my original description to show how certain individuals differ from others.

Pale ash-gray. — Male. — Head and palpi ash; wings a little paler, sometimes with a testaceous line. — The fore wings are marked just like *T. marcescaria*, though the line is less distinct, but they are narrower and more excavated just below the apex. — The strigae are a little thicker on the costa than elsewhere. — There are no indications of a basal line; the outer line is situated nearer the middle of the wing than in the other species; in the middle of the wing on the line is a black dot. — Just beyond the line is a semi-translucent broad band. — Discal dot as in the other species. — Beneath, the

fore wings are pale-ash, clear in the middle of the wing, with a speckled costa and outer edge. Hind wings ash, mottled densely with brown scales; discal dot distinct; the wings darker on outer half beyond the single distinct brown line, with a dusky patch in the middle of the wings adjoining the line.

In the female, there is only an obscure band on the fore wings. The hind wings are more angulated and dentated than in *T. marcescens*.

Length of wing, 0.56; body, ♂, 0.45; expanse of wings, 1.25 inches.

Sanzalito, Cal., January 16, April to May 20 (Behrens); California (Edwards).

THAMNONOMA GUENEARIA, *sp. nov.* Plate 9, fig. 70.

2 ♂.—Body resembles in form *T. tripunctaria*, but the palpi are much shorter, though longer than in *T. wavaria* or *4-linearia*. Antennae well pectinated, though the branches are shorter than in *T. tripunctaria* or *4-linearia*. The shape of the fore wings is intermediate between *T. 4-linearia* and *tripunctaria*, being slightly falcate, but scarcely excavated below the apex, nearly agreeing in this respect with *T. 4-linearia*. The hind wings are not angled, but slightly scalloped. Antennae, front, palpi, and fore legs ochreous. Body and wings gray, with a slight ochreous tinge. Three dark, equidistant, costal spots, but with no lines running from them. The only line is a submarginal, distinct, ochreous, slightly sinuous line, edged slightly and irregularly on both sides with dusky. A marginal row of dark dots. A small discal dot on each wing. Hind wings a little paler than the anterior pair, dusted, but with no lines. Beneath, bright ochreous, dusted transversely with brown; both wings alike. A large, dusky, square, median, costal spot; sometimes four irregular costal patches. The line is faintly reproduced, but there are no other markings. Legs as usual.

Length of body, ♂, 0.42; of fore wings, ♂, 0.57; expanse of wings, 1.10 inches.

North California (Crotch, Mus. Comp. Zoöl.).

This species differs from any of the others in its single, outer, slightly sinuous, bright-ochreous line. On this account, it is liable to be confounded with some species of *Phasianæ*, such as *P. irroraria*.

THAMNONOMA QUADRI LINEARIA Packard.

Italia quadrilinearia Pack., Proc. Bost. Soc. Nat. Hist., XVI, 26, 1874.

2 ♂.—Closely resembling *T. wavaria*, to which section of the genus it

belongs, the wings being less falcate than in the other species, *marcescens* and *tripunctaria*. The antennae are more broadly pectinated than in *T. wararia*, being in this respect intermediate between *T. wararia* and *tripunctaria*. Pale ash-gray; head, palpi, and body being concolorous with the wings. Fore wings marked as in *T. wararia*, having four distinct costal brown spots, from which as many lines run parallel with each other to the costa; the second one includes the discal dot, but is straighter, not so much angulated as in *T. wararia*, nor so wide just above the discal dot; the two outer lines become obsolete in the middle of the wing, but are indicated on the hind edge, the third being close to the fourth, while beyond is a small dusky patch. A row of interveicular black marks; fringe concolorous with the rest of the wings. Hind wings with no marking, except the discal dot, which is quite distinct. Beneath, pale ash, more uniformly so than in *T. wararia*, tinged faintly with ochreous, deeper on costa of fore wings. Discal dots present on both wings, and three faint costal patches.

Length of body, 0.48; fore wing, 0.64; expanse of wings, 1.40 inches. Sierra Nevada, Cal. (Edwards).

Closely resembling *T. wararia*, it differs in the more broadly-pectinated antennae, the less angulated, narrower second line on primaries, and the duller ash on under side of wings, which, especially the secondaries, are beautifully marbled in *wararia*; in these respects it resembles the species of *Semiothisa*.

THAMNONOMIA WARARIA Lederer. Plate 9, fig. 72.

Phalana-geometra wararia Linn., Syst. Nat., edit. x, 522, 1758.

"*Geometra wararia* Hubn., Schm. Eur., tab. 41, fig. 55, 1796."

Fidonia wararia Treits., Schm. Eur., vi, c. 302, 1827.

Halia wararia Dup., Lep. France, xii (iv), 402, pl. 163, figs. 3 and 4, 1829.

Grammatophora wararia Steph., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 126, 1829."

Halia wararia Steph., Ill., iii, 194, 1831.

Halia wararia Boisd., Gen. Ind., 187, 1840.

Fidonia wararia H.-Sch., Schm. Eur., iii, 88, 1847.

Halia wararia Steph., Cat. Br. Lep., 159, 1859.

Thamnomoma wararia Lederer, Verh. Bot. Zool. Ges. Wien, 179, 1853.

Halia wararia Guen., Phal., ii, 93, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 211, 1861.

6 ♂ and 5 ♀.—Antennae with longer pectinations than in *T. subcassaria*; the fore wings produced toward the apex, the outer edge of the wing being quite oblique. Hind wings with three well-marked scallops below the apex. Body and fore wings pale chocolate-brown; hind wings paler. Palpi with an ochreous tinge. Fore wings with the usual four costal spots, much as in

T. subcessaria, but the lines proceeding from them more distinct and continuous. The second spot edged with blackish externally in the discal space, and the line plainly continuous to the inner edge of the wing. A broad, dusky, chocolate, marginal shade, disappearing before reaching the apex. Fringe faintly checkered with whitish opposite the marginal dark dots. Beneath, both wings decidedly tinged with ochreous, especially the costa of fore wings and entire surface of hind wings. Discal dots large, diffuse on both wings. The costal spots and lines faintly reproduced as smoky diffuse lines. A faint diffuse line on each side of discal dot on hind wings, not visible above. Fringe faintly checkered with whitish, not so distinct and broad as in *T. subcessaria*. Legs ochreous, spotted with brown.

Length of body, ♂, 0.50, ♀, 0.45; of fore wing, ♂, 0.62, ♀, 0.62; expanse of wings, 1.25 inches.

(Gorham, Me. (F. W. Putnam); Salem, Mass. (Emerton and Packard); Brookline, Mass., July 10 (Shurtleff); Medford, Mass. (L. Trouvelot); Andover, Mass. (P. S. Sprague); Brooklyn, N. Y. (Graef); Philadelphia, Pa. (Amer. Ent. Soc.).

This species, apparently imported from Europe, differs from our native *subcessaria* by the three scallops on the hind wings, the more broadly-pectinated antennae, the chocolate-color of the fore wings, and the yellowish under side of both pairs. In one female, from Philadelphia, the wings are unusually white, and the lines much heavier than commonly the case; the two inner ones not interrupted, while the outer is continuous from the inner edge to the third median veinlet.

THAMNOMIA SUBCESSARIA Packard. Plate 9, fig. 71.

Halicta subcessaria Walk., List Lep. Het. Br. Mus., xxiii, 945, 1861.

2 ♂ and 2 ♀ —Antennae slightly pectinated; fore wings with the apex obtuse, less produced than usual; hind wings rounded, scarcely bent in the middle, or distinctly scalloped. Body and wings white, with scattered dark speckles. Head dull-whitish; palpi and prothorax brown. Fore wings with four well-marked costal spots, of which the subapical is snuff-brown, while the others are blackish. The basal is small, triangular, followed by a series of dark, small, venular dots. The second is oblong, with square edges, and not curved as in *T. wararia*; it extends to the median vein and is succeeded by a few dark obscure venular dots. The three costal spots are of the same

size as the second, and the line of venular dots is much curved. The sub-apical patch broad, squarish. A marginal row of dark dots. Fringe a little darker than the wing, and slightly checkered with white stripes. Hind wings finely mottled with ochreous scales, not arranged in lines; discal dot distinct. Beneath whitish, tinged decidedly with ochreous, and transversely strigated with pale-brown on anterior wings, and more mottled than strigated on the hind wings. Fringe more distinctly and broadly checkered than above, and marginal row of spots more distinct than above. Legs yellowish, thickly spotted with brown.

Length of body, ♂, 0.54, ♀, 0.47; of fore wing, ♂, 0.60, ♀, 0.59; expanse of wings, 1.20 inches.

Amherst, Mass. (Peabody); Hastings, N. Y. (Grote); Northern Illinois (Clemens); London, Canada (W. Saunders); West Farms, N. Y. (Angus); Brooklyn, N. Y. (Graef).

Not only by its white color, but by its obtuse fore wings and the want of the three scallops in the outer edge of the hind wings, may this species be readily distinguished from its imported European representative *T. maritima*.

THAMNOXOMA SULPHURARIA Packard. Plate 9, fig. 62.

Eupisthorix sulphurea Pack., Fifth Rep. Peab. Acad. Sc., 77, 1873.

2 ♂ and 2 ♀.—Uniformly sulphureous; palpi large, stom. perfect, reaching far beyond the head; concolorous with the head and rest of body. Male antennæ pectinated, thickly ringed with brown. Wings sulphur-yellow, with three triangular costal brown spots, a large brown discal dot, and a similar spot on the outer third of the inner margin; a few transverse strigæ, but no lines as usually seen in this genus. On the hind wings, two rows of large diffuse spots, both beyond the discal dot, the inner of which only reaches to the middle of the wing, while the outer is more regular, following the line of the outer edge of the wing. Fringe long, brown, on the hind wings interrupted with ochreous; at base on both wings a marginal row of dark dots. Beneath much more strigated than above. Veins very distinct, being deeper ochreous than on the interspaces.

Length of body, 0.38; of fore wing, 0.45; expanse of wings, 1.15 inches.

Brookline, Mass. (Shurtleff); Natick, Mass. (Stratton); Brooklyn, N. Y. (Graef); Victoria, Vancouver's Island, July (Crotch).

Easily known by its pale sulphur-yellow hues, the usual lines on the fore

wings being obsolete, more distinct on the hind wings, where there are two lines, and by the three costal triangular spots as well as the large discal spot, and another large brown patch on the inner edge of the fore wing; while beneath, the wings are much more strigated than above. The New York and Vancouver's Island examples present no differences in size or markings.

THAMNOMOMA FLAVICARIA, *sp. nov.* Plate 13, fig. 49.

2 ♂ and 3 ♀.—Structurally, this species is closely allied to *T. brunnearia* and *argillacaria*, but the fore wings are a little more falcate and the hind wings more produced than in these species, the hind wings of the female being considerably more so than in the male. Antennae of the male well pectinated; body and wings bright yellow-ochreous, the hind wings being concolorous with the anterior pair. Fore wings yellow, quite thickly dusted with brown; four well-marked costal spots, the third being the largest, the fourth narrower and usually forming part of the extradiscal line, which is sinuous, and toward the inner margin accompanied by a broad shade. Just beyond the middle of the line is either a single or twin patch, often well defined and square. In the female, there are four subparallel lines, the three inner costal spots sending lines across the wing. In both sexes, the discal dots are very distinct. In the male, there are traces of a single submarginal line; but, in the female, there are traces of two, one extradiscal and one submarginal. The under side of the male is concolorous with the upper side, while the discal dots are very distinct, and there is a broad, brown, submarginal, indistinct band, common to both wings; while, in the female, there are traces of an extradiscal line, common to both wings.

Length of body, ♂, 0.46, ♀, 0.52; of fore wings, ♂, 0.58, ♀, 0.58; expanse of wings, 1.15 inches.

Manitou, Colorado, July 13–16, common, flying about the cliffs in William's Cañon; common in gardens July 21, Salt Lake City, and in fields, Farmington, Utah, July 20 (Packard, Hayden's Survey).

This species differs from *T. sulphuraria* in the less decided straw-yellow hue, and the more decidedly falcate wings, and the heavier, darker markings.

THAMNOMOMA BRUNNEARIA Lederer. Plate 9, fig. 63.

"*Geometra brunneata* Thunb., Diss. Ent., i, 9, 1784."

"*Geometra pinctaria* Hübn., Schm. Eur., tab. 24, fig. 130 (after 1797)."

"*Geometra quinquaria* Hübn., Schm. Eur., tab. 100, fig. 516, 517, ♂, after 1797."

Peronia quadraria Hubn., Verh., 1296, 1818.

Palona pictaria Treits., Scher., Ent., VI, 1826, 1827.

Speranza sylvaria Curt., Brit. Ent., 225, 1828.

Steph., Nouvel. Br., 1830, 43, 1839.

Speranza brunnata Steph., Cat. Br., Lep., 457, 1850.

Thaumonomia brunnata Federer, Verh. Bot. Zool. Ges. Wien, 179, 1853.

Palona pictaria Guen., Phalaen., 457, 1857.

Empistonia pictaria Walk., East. Lep. Hb., Br. Mus., xxix, 1940, 1862.

Epithoria ferruginaria Pack., Earth Rep. Peab. Acad. Sci., 78, 1873.

♂ 8 and ♀ 4.—Front of head and palpi concolorous with rest of body. Of exactly the form of *T. argillacaria*: the antennae pectinated in the same manner. Uniformly Scotch-smuff brown, with no markings except a few darker costal specks, sometimes four larger equidistant spots, with four obscure lines proceeding from them. A slight, dark, discal spot on each wing. Beneath, uniformly deep dull-ochreous with no markings or discal dots. Fringe a little darker above and beneath than the wings. Light ferruginous reddish-brown, ochreous on the costa, darker toward the outer margin; dusted with transverse strigæ, especially conspicuous on the costa of the fore wings. On the fore wings, three transverse dark-brown lines, dilating broadly on the costa, the two basal ones angulated on the median vein, the third curved, especially on the anterior half of the wing: the outer triangular costal spot half-way between the third line and the tip: fringe long, dull, smoky. Hind wings somewhat paler ochreous, with two very distinct dark lines: the inner straight, the outer obtusely angulated in the middle. A narrow discal dot on both wings, but more distinct on the hind wings. Beneath, bright ochreous, tinged with reddish on the venules: the lines re-appear beneath, being broader and more diffuse: the wings speckled thickly with ferruginous on the basal half. Legs very long and slender: tibiae and tarsi dark: femora paler, speckled.

Length of body, ♂, 0.12, ♀, 0.40: of fore wings, ♂, 0.50, ♀, 0.45–48; expanse of wings, 92–112 inches.

Maine, June 25 to July 8, in pine-woods (Packard); sides of Mount Washington, N. H., July (Morrison); Natick, Mass. (Stratton, Mus. Bost. Soc. Nat. Hist.).

This form may be recognized by its resemblance in the shape of the wings and antennæ to *T. argillacaria*, and by the uniform dull smuff-colored wings and dull-ochreous under side of the males. The females differ unusually in coloration, being bright-ochreous, with three dark-brown lines.

Our examples are so closely similar to European specimens (male and

female) that I see no sufficient grounds for separating them. The males from Maine differ from a single male from Germany in having the four lines more slightly marked than in the latter; the German example is slightly larger than most of the Maine examples, but one or two are of the same size. My three Maine females only differ from the European one in being a little smaller. It varies very slightly, the males (all taken in Maine) usually having no lines; sometimes there is a very obscure common line on the under side of the wings, and an obscure basal line on the hind wings.

Larva.—Treitschke describes the caterpillar as feeding on the bilberry; and being of a reddish tint, with white stripes on the back, and a yellow stripe on the sides (Newman).

THAMNONOMA ARGILLACEARIA Packard. Plate 9, fig. 64.

Tiphina argillacearia Pack., Sixth Rep. Peab. Acad. Sc., 48, 1874.

30 ♂ and 6 ♀.—This pretty modest species is of a uniform argillaceous hue, sometimes with an olive-greenish tinge, with no lines, but two large costal blackish spots on the outer half of the wing; a large, round, faint, discal spot on both wings, slightly darker than the rest of the wing, and usually not present in specimens at all rubbed. The head is slightly ochreous, and there are ochreous points on the edge of the costa. Beneath as above, but mottled with ochreous, and especially on the costa of the fore wings and on the entire surface of the hind wings. Legs and fringe concolorous with the body.

Length of body, ♂, 0.48, ♀, 0.45; of fore wing, ♂, 0.60, ♀, 0.50; expanse of wings, 1.20 inches.

Brunswick, Me. June 25 to July 10 (Packard); Massachusetts (Grote); Philadelphia, Pa. (Amer. Ent. Soc.); London, Canada (W. Saunders, Mus. Comp. Zoöl.); Andover, Mass., August (Sanborn); Natick, Mass., July 24 (Stratton); Carver, Mass., July 10, July 28, August 1 (Shurtleff, Bost. Soc. Nat. Hist.). It is very abundant in pine-woods in Maine on a dry soil, rising and fluttering with rather a feeble flight and soon settling again. In July, 1874, I captured thirty males before securing a female; the latter are apparently less ready to fly.

In an abnormal specimen from Jamaica Plain (Morrison), the two fore wings are of the same size, but the right hind wing is half the size of its fellow; the discal spot and veins present, but the latter nearly one-half shorter, more bent, and the interspaces wider.

This species is easily recognized by its want of any markings on the wings, except the two costal dark spots, which are usually wanting in most cabinet-specimens, and by the well-marked pectinated antennae. It varies in tint, being pure clay ash, or with an olive greenish tinge, with sometimes but one, rarely two, costal spots, and usually none at all.

MARMOPTERYX, *gen. nov.*—Plate 3, fig. 3, 3*a*.

Compared with certain species of *Thaumnomia*, such as *T. arguticornis*, which certain species resemble, it is found to differ in the fore wings not being subfalcate, the costa being straight, the apex well rounded, while the outer edge of the wing is not excavated, being more or less oblique. The hind wings are rounded, not angulated, and somewhat produced toward the apex. The front of the head is full, bulging out much more than in *Thaumno. umet*. The palpi are short, not projecting far beyond the front, while the male antennae are not pectinated, simply ciliated. Venation: two large subcostal cells; costal vein free from the subcostal; the two discal venules transverse; the posterior one bent.

In coloration, the species are remarkable for the white spots and bands on the clay-colored ground-color, while the fringe is usually whitish, conspicuously checkered with brown; and beneath, the wings, especially the hinder pair, are beautifully marbled with white and brown.

Synopsis of the Species.

Fore wings much rounded, marbled above..... *M. arguticornis*.
Larger than the other two species; fore wings much pointed..... *M. roosevelti*.
Fore wings neither golden-yellow..... *M. schultzei*.

MARMOPTERYX STRIGULARIA Packard. —Plate 9, fig. 65.

An. ap. strigularia Mord. III, Proc. Bost. Soc. Nat. Hist., ser. 17, 1873.

Teplaria strigularia Pack., Proc. Bost. Soc. Nat. Hist., ser. 23, 1874.

Laurentia angustata Harvey, Bull. Buffalo Soc. Nat. Sci., pl. II, fig. 9, 1874.

♂ and ♀.—Fore wings much rounded at apex; median venules rather short; front of head less full and protruding than in *M. moresbecki* from Nevada. Body and wings uniform sable ash-color, mixed with blackish scales on the front of thorax, and on head and palpi. Male antennae angulated above with blackish. Fore wings with three large costal white spots, from the outer of which proceeds a curved broad shade, which fades away on the independent venule, but may be traced as it curves around nearly to the

inner edge. The two inner costal spots are within the basal half of the costa. Costa darker than rest of wing, with pale strigæ. Outer margin of wing beyond the outer whitish shade dusky. Fringe checkered conspicuously with dark, with two narrow costal white checks just before the apex. Hind wings uniform sable-ash, with no markings; fringe checkered. Beneath, marbled and mottled with white and black, reminding us of the peculiar markings of *Chionobas*. Fore wings with costal and outer margin marbled, inner portion of wing uniformly sable. The three costal spots distinct as above, the outer band disappearing entirely on the independent venule. An apical whitish region. Fringe on both wings dark, checkered with black, and with a slender line near the base. Hind wings uniformly marbled over whole surface. Within the middle of the wing, a white, linear, transverse spot connecting the discal fold with the subcostal vein. Beyond the middle of the wing, a white band, distinct on the costal and inner edge, but fading out in the middle of the wing; each end of the band with a broad blackish patch outside; inner margin of wing blackish. Legs blackish, spotted with white. Abdomen with a row of black dots on each side.

Length of body, ♂, 0.43, ♀, 0.45; of fore wing, ♂, 0.67, ♀, 0.70; expanse of wings, 1.40 inches.

"Montreal, Canada" (Harvey); Montpelier, Vt., August (Sanborn, Bost. Soc. Nat. Hist.); West Virginia, April (Mead).

The three costal spots vary in either being at equal distances apart, though more usually the two inner spots are nearer together than the middle and outer ones; otherwise it does not vary much.

This beautiful species may at once be known by the three conspicuous costal white spots, the outer terminating in a faint shade, and by the mesial white band of secondaries being obsolete in its middle third. The beautifully-marbled under surface will at once distinguish it from any of our other moths of this family. The Californian *M. marmorata* approaches *Sclidosema* in the acute primaries, and wants the two basal spots on the costa.

MARMOTERYX MARMORATA Packard. Plate 9, fig. 66.

Ephrena marmorata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 393, 1871.

2 ♀.—Closely allied in form and markings to *M. strigularia*, wrongly referred by Mr. C. S. Minot (Proc. Bost. Soc. Nat. Hist., vol. xii) to *Anisopteryx*. These two species belong to a distinct section of the genus.

The front of the head is much fuller than usual, the wings are more pointed, and the palpi are quite short, projecting but a little distance beyond the front. Body and wings pale-ash, with a testaceous hue; a little deeper line on the outer edge of both wings. The costal edge is tinged faintly with reddish-ochreous, and marked with minute strigæ, most distinct on the extreme edge. A square whitish spot on the inner third of the costa, and an outer, white, distinct line broadest on the costa, becoming very faint before reaching the inner edge of the wing, bent on the first median venule. The fringe on both wings is white, checkered with large, square, brown spots; no discal spot above or below on either wing. Under side of costal region and outer edge of the fore wings bathed with yellow testaceous; veins distinct, testaceous; extreme costal edge dark, with white strigæ. Outer white line faintly reproduced, making with the white apex a rude **V**, inclosing a triangular mottled space; remainder of the wing clear of scales. Under side of hind wings marbled beautifully, the ground-color being white, with dark strigæ arranged in broken bands, and with diffuse ochre-yellow blotches; a central, broad, white band, angulated on the independent venule, bordered on both sides with yellowish spots, especially on the venules, and the wing within is densely strigated, with the median area white with a few brown strigæ; from the inner angle arises a broad, interrupted, white band, which terminates on the first median venule. The outer edge of the wing is sprinkled with brown, especially on the apex and costa; elsewhere it is pure white. Prothoracic scales and patagia reddish-ochreous; middle of thorax and abdomen concolorous with the upper side of the wings.

Probably from near the snow-line, as our New England species was found by Mr. Sanborn on the summit of Mount Mansfield, Vt.

Length of body, 0.50; fore wing, 0.75; expanse of wings, 1.60 inches.
Nevada (Edwards).

MARMOPTERYX TESSELLATA Packard.

Marmopteryx tessellata Pack., in Hayden's Ann. Rep. Geol. Surv. Terr., 552, pl. 1, fig. 6, 1873.



Marmopteryx tessellata.

1 ♀.—Compared with *M. marmorata* from California, its nearest ally, the fore wings are rather narrower and the outer edge more oblique, while the apex is more pointed. The head is exactly as in that species, the front being full and bulging. Head and thorax pale-gray, with a reddish tinge. Palpi blackish at tip. Front of head with a slight

yellowish tint, reddish between the antennae. A dark streak on each side of prothorax, and a long, narrow, dark-brown slash on the patagia. Both wings of a rich golden-yellow, with dusky slate-brown margins. Fore wings with the costa pale slate-color, checkered broadly with five large, square, white spots, and two minute, whitish, linear spots near the apex. Outer edge dusky, the dark margin narrowing toward the inner edge. Fringe very long and slate-colored, checkered conspicuously with white. Hind wings like fore wings; the costa is narrowly edged with slate. Beneath, the wings are brightly colored: the anterior pair dull golden-yellow, with a reddish tinge on the costal side. Borders of the wing checkered very conspicuously as above: the apex, however, whitish. Hind wings pale fawn-colored, marbled with white, with a costo-apical, oblong (transversely), white spot, and a large, square, white spot in the middle of the wing below; costa marbled with whitish, abdomen pale fawn-color, like the thorax.

Length of body, ♀, 0.45; of fore wing, ♀, 0.64; expanse of wings, 1.30 inches.

Arizona (Dr. Palmer, Department of Agriculture).

Though this species is described from Arizona, it may be confidently looked for in Southern Colorado. The species is so remarkable that I venture to describe it from a single individual. It may be readily recognized by its rich golden-yellow wings, the checkered costa of the anterior pair, and the broad dusky margin of both wings, while the hind wings beneath are beautifully marbled.

PHASIANE Duponchel. Plate 3, fig. 5.

Phasiane Dup. (in part), Lep. France, vii (ix), 109, 1829; viii (x), 115, 1830.

Eubolia Boisd. (in part), Gen. Ind., 201, 1840.

Edonia H. Sch. (in part), ib., 84, 1846.

Phasiane Lederer (in part), Verh. Bot. Zool. Ges. Wien, 233, 1853.

Ephrina Guen. (in part), Pluk., ii, 95, 1855.

Walk. (in part), List Lep. Het. Br. Mus., xliii, 951, 1861.

Male antennae either slightly pectinated, or simple and slightly ciliated; female simple. Palpi stout, of moderate length; third joint pointed, porrect, passing beyond the front by a distance twice the length of the third joint. A short frontal tuft between the palpi. Fore wings subfalcate, the apex subacute; costa straight, the outer edge slightly bent. Hind wings square, being bent just below the apex, which is well rounded, and again on the first median, while the inner angle is rectangular. The venation is very

much like that of *Semiothisa*, the costal region being narrow; the subcostal veins are longer and more parallel to the costa than in *Semiothisa*; the outer end of the subcostal areole is open, being closed in *Semiothisa* and *Diastictis*. In this respect it resembles *Eubolia*, in which it is also open. The costal vein joins the subcostal areole opposite the anterior discal venule. Abdomen long and slender, rather square at the tip. Hind tibiae swollen; tarsi a little over half as long as the tibiae. The markings of this genus are usually very characteristic, the front wings being crossed by three well-marked lines, the outer and inner often bright ochreous, the yellowish portion sometimes suddenly disappearing near the costa; the yellowish lines are sometimes replaced by distinct, black, straight or sinuous lines. There is usually a single line on the hind wings, either entire or obsolete before reaching the middle of the wing. Four indistinct discal dots usually present. The females scarcely differ from the males in the shape of the wings and markings.

This genus may be known by the usually slightly subfalcate fore wings, the straight costa, bent outer edge, square hind wings, with the apex well rounded, by the long slender abdomen, and the swollen hind tibiae. *Eubolia*, which is represented in this country by an undescribed species, differs from it in the fore wings being much more rounded at the apex, the costa straighter, being slightly curved in, and by the fuller outer edge, while the costal edge of the hind wings is shorter. (*Eubolia murcinaria* is the only named species I have for comparison.) *Diastictis* is remarkably near *Phasiane*, and at first I was inclined to regard the differences as not generic; it differs from *Phasiane* simply in the longer pectinations of the antennae and the more rectangular apex of the fore wings and the more decided bend in the outer edge of the wing, but especially in the much longer, slenderer hind legs, the tibiae not being swollen. The venation differs more decidedly, the subcostal areole being wider, the whole costal region in fact wider, and the cell being closed.

The species vary in the antennae and shape of the fore wings; in *P. atrotasciata* and *P. subminiata*, the costa and outer edge being very straight, especially the outer edge.

P. atrotasciata and *subminiata* in their venation are almost identical with the lower division of *Semiothisa*, the subcostal areole being open externally, and, except in the style of markings, it seems impossible to separate the two genera; and the separation as regards *G. ocellinata*, *californata*, and *P. atro-*

fasciata and *P. subminiata*, which I have described as a *Macaria* (*Semiiothisa*), is an artificial one. I believe that *Semiiothisa* and *Phasiane* originated from the same stock, since the generic characters of these species agree remarkably. This converging of generic characters of the lower species of allied genera is seen throughout the family, and probably indeed in almost every family and group of the animal kingdom. In like manner, the distinctions between the two above-mentioned genera and *Eubolia* and *Diastictis* are highly artificial, and I adopt them as genera simply for convenience. It is putting nature in a straight-jacket for a temporary purpose.

SYNOPSIS OF THE SPECIES.

Atlantic and Rocky Mountain States.

A. Fore wings not falcate; outer edge very oblique:

- Three parallel black lines, inner and outer not curved..... *P. atrofasciata*.
- Three heavy black lines, outer very sinuous, inner curved..... *P. orillata*.
- Fore wings acute; no well-defined lines; wings much mottled..... *P. nubiculata*.
- With a vermilion tinge; outer line very sinuous..... *P. snoriata*.

B. Wings subfalcate:

a. Outer and inner lines black:

- Like *snoriata*, but wings more produced, with two very heavy curved lines on fore wings..... *P. meadiata*.

b. Outer and inner lines yellow:

- Outer line bent very near the apex..... *P. mellistrigata*.
- Outer line gently sinuous, rather near the outer edge; a discal ringlet..... *P. trifasciata*.
- Outer line remote from the outer edge, sinuous; a discal ringlet..... *P. sinuata*.

Pacific States.

A. Fore wings not falcate:

- Like *snoriata*, tinged with vermilion..... *P. subminiata*.

B. Fore wings subfalcate:

- Clay-yellowish, a broad inner and outer line; much speckled with gray and black..... *P. irrorata*.
- Like *sinuata*, but the brown portion of the outer line in *sinuata* is yellow, and the line is nearer the outer edge..... *P. aptata*.

PHASIANE ATROFASCIATA, *sp. nov.* Plate 9, fig. 74.

Macaria orillata Pack., Fifth Rep. Peab. Acad. Sc., 63, 1873.

3 ♀.—Fore wings not subfalcate, the costa and outer edge very straight (the latter unusually oblique), more so than in any other species of the genus. Body and wings granite ash-gray, of the same color as *P. orillata*. Three very oblique parallel black lines; the inner straight and firm in its course,

terminating on the costa, nearly twice as far from the insertion of the wing as on the inner margin. The middle line is faint, and passes over the site of the discal spot. The outer line is nearly straight in its oblique course, not sinuous, though sometimes very slightly so, and is closely accompanied by a less distinct dark line, beyond which is a faint dusky shade reaching half way between the line and the edge of the wing. A slender, interrupted, marginal, black line. Hind wings with two approximate black lines just beyond the middle of the wing, starting from the inner edge and fading out (in my specimens) before reaching the middle of the wing. Beneath, no lines, and the discal dots obsolete. Both wings are mottled with white and clouded toward the outer margin. Hind tibiae swollen; tarsi a little longer than usual.

Length of body, ♀, 0.40; of fore wing, ♀, 0.46; expanse of wings, 1.05 inches.

Waco, Tex., July 12, September 11 (Beltrage, Mus. Peab. Acad. Sc.).

This interesting species, which by mistake I had referred to *Semiothisa* (*Macaria*), is in its venation and markings a true *Phasian*. It may be distinguished from *P. orillata* by the more oblique and straight lines, the basal not being curved, and the double extradiscal not sinuous, while the wings are narrower and the outer edge less full and rather more oblique.

PHASIANE ORILLATA Packard. Plate 9, fig. 75.

Anatis orillata Walk., III, List Lep. Het. Br. Mus., xxvi, 1740, 1862.

Phasian curvata Pack., Sixth Rep. Peab. Acad. Sc., 47, 1874.

2 ♂ and 3 ♀.—This species is intermediate in form and style of markings between *P. excurrens* and *P. atrofasciata*. Male antennae simple, ciliated. The fore wings are not subfalcate, the costa being very straight; the apex subacute and less convex than usual. On the other hand, the wings are broader than in *P. atrofasciata*, though of much the same shape. Body and wings granite-gray, of the same tint as the above-named species. Fore wings with two strongly-marked, conspicuous, heavy, black lines, the inner curved regularly outward and situated on the inner third of the wing. The outer (extradiscal) line is sinuate, with a decided angle below the costal region, nearly opposite the discal dot. A faint brown shade along the outer side of the extradiscal line. A faint middle line including the small discal dot, which is a simple black dot, not forming a circle. A marginal series of elongated linear spots, much as in *P. atrofasciata*. Hind wings concolorous with

the anterior pair: a black discal dot, and a single, slightly sinuous line curved out a little opposite the discal dot, and widening on the inner edge. Beneath whitish-ash, with the four discal dots present, and the two lines on the fore wings and the single line on the hind wings faintly reproduced. Hind tibiae swollen; tarsi half as long as the tibiae.

Length of body, ♂, 0.40, ♀, 0.48; fore wing, ♂, 0.45, ♀, 0.55; expanse of wings, 1.10 inches.

Beverly, Mass., August 28 (Burgess); Boston, Mass. (Morrison); New Jersey (Sachs); Easton, Pa. (Clemens, Stultz); Dallas, Tex., in March, not rare, about *Juniperus Virginiana*, and also in October, June 16 (Boll, Mus. Peab. Acad. Sc.).

This species differs from *P. atrofasciata* in the broader wings and the usually more sinuate and angled outer line and the curved inner line. The species is more nearly related to the latter than to any other. My Pennsylvanian male is much smaller than the Texan males or the females, and the two lines are more curved and approximate. The Texan male is much larger than the Pennsylvanian one, and the two lines on the fore wings are much farther apart, while the basal line is straight, not curved outward. In the Texan male, also, the costa of the fore wing is slightly curved inward, the apex being much rounded, the shape of the wing being much as in the European *Eubolia murinaria*.

As the specimen described as *P. hasiane excurrata* differs in some respects from the eastern examples, I append the original description:—

1. ♂.—In the outline of the wings, the antennae, and in other structural features, this species is closely allied to *P. trifasciata* Pack., but the markings are quite different. Body and wings deep mouse-gray. Fore wings with inner line not curved as usual, but straight, in its course oblique, ending nearly twice as far on the costa from the base of the wing as on the inner edge; the line is black, with an inner dusky shade accompanying it. Middle line not curved exactly parallel to the inner, blackish and passing very near the oblong discal dot. Outer line black, rather oblique, curved outward a good deal just below the costa opposite the discal dot. A dusky shade not much wider than the line itself accompanies the line, and is connected with a broad costal spot midway between the outer line and the apex of the wing. A peculiar whitish, very broad, diffuse, irregular shade starts from the apex, where it is narrow, and ends on the anal angle of the wing. Hind wings

with the same submarginal whitish, obscure band, and with three parallel dusky lines, much as in *P. trifasciata*. Beneath, much as in the latter species, but the submarginal smoky band is wanting, and there are no lines present, while the hind wings are mottled as usual, but whiter; anterior legs rather dusky, ringed with paler.

Length of body, ♂, 0.50; of fore wing, ♀, 0.60 inch.

"Rocky Mountains" (Grote).

The outer line suddenly excurved opposite the discal dot separates this from the other species; the lines are also all dark, with no tawny yellow shade accompanying them, and in this respect it differs from all the other species to which it is closely related; *i. e.*, *P. neptata* and *P. sinuata* of the Rocky Mountains and Pacific coast, and the eastern *P. trifasciata* Pack. and *mellistrigata* Grote. The outer line is less oblique than in *P. mellistrigata*.

PHASIANE SUBICULATA, *sp. nov.* Plate 13, fig. 15.

2 ♀.—Palpi as usual; fore wings more acute at the apex than usual, the costa being very straight and the outer edge more oblique and longer in proportion to the inner edge than in most of the other species. Body and wings white, clouded with dark brown. Instead of the usual two very distinct lines, there are four indistinct parallel lines equally indistinct on account of the speckled and spotted surface of the wing. The two inner lines are parallel and similar. The two outer lines are nearer together and more or less broken and diffuse, with a white line between and beyond them, the submarginal white line being a little sinuous. The usual marginal, dark, broken line on both wings. Hind wings with no distinct lines, but mottled with brown, and with some ochreous scales; discal dot obscure. The fringe is long, with two brown hair-lines externally. Beneath, both wings alike, quite uniformly mottled with brown and ochreous, but with no lines, though the discal marks are slightly indicated, not being present above on the fore wings.

Length of body, ♀, 0.35; of fore wings, 0.46; expanse of wings, 1.05 inches.

Colorado (Sachs): Bridger, Wyoming, July 20 (Packard, Hayden's Survey)

This is a well-marked species, and quite different from any others of the genus, though most nearly related to *P. orillata*. It differs, however, in the

wings being so much mottled, and in the want of well-defined black lines on the fore wings, and of any traces of one on the hind wings. The fore wings are more acute than usual, and the outer edge is very long and oblique.

PHASIANE SNOVIATA Packard. Plate 10, fig. 1.

Not *Panagra subminiata* Pack., Proc. Bost. Soc. Nat. Hist., xvi, 25, 1871.

Macaria subminiata Pack., Sixth Rep. Peab. Acad. S. i., 49, 1871.

2 ♂.—This is a grayish moth, suffused with vermillion on the body and wings. It agrees very closely with *Semiothisa s-signata*, from Texas, in the form of the body and the peculiar cut of the wings; the fore wings being entire on the outer edge, and the hind wings rounded and not angulated. The head and prothorax are not discolorous with the rest of the body. The antennae are not so well ciliated as in *Semiothisa s-signata*. Fore wings vermillion-gray, with a basal, regularly-curved, black line, ending on the subcostal line rather nearer the large oval discal dot than the base of the wing. No traces of a median line. Outer line black, regularly sinuous, curving once outward opposite the discal spot, and once inward below, widening on the inner edge, and growing narrow and faint on the costa; it is faintly edged with vermillion on the inside, and externally is accompanied with a broad, dusky, blackish shade extending more than half-way to the outer edge. Hind wings concolorous with anterior pair, a little more clouded, with no lines. Beneath, decidedly tinged with vermillion, especially costa and veins, with no lines, except a marginal, dark, diffuse shade common to both wings. Legs concolorous with the body.

Length of body, ♂ 0.40; of fore wing, ♂, 0.47; expanse of wings, 1.00 inch.

Lawrence, Kans. (Prof. F. H. Snow).

Resembling *P. meadiata*, it differs in its rather more decided vermillion tinge and the much more sinuate outer line. The wings are more speckled, and the body and wings are shorter and thicker than in *P. meadiata*. The wings in the latter species are much clearer, and the two dark bands much more conspicuous.

On reviewing the generic characters of *Phasiane*, I find I was mistaken in referring this species to *Semiothisa* (*Macaria*), and consequently change the specific name to *snoviata* in honor of the discoverer of the species.

Another specimen from Lawrence, Kans., received from Professor Snow,

is a marked variety: the two dark bands on the fore wings being obsolete, but the discal dot is present, and a dark reddish brown, broad, sinuous shade replaces the dark smoke-colored shade in the normal specimen; otherwise the two specimens do not differ.

PHASIANE MEADATA Packard. Plate 10, fig. 2.

Phasiane meadata Pack., Sixth Rep. Peab. Acad. Sci., 47, 1874.

1 ♂.—This is very closely allied to the European *P. rippartaria* Dup., the style of markings being identical. Body and wings carneous-gray. Fore wings with light and dark streaks on extreme edge, especially marked opposite the lines. Two broad, conspicuous, dark lines not reaching the subcostal vein: the inner slightly curved, disappearing in the middle of the discal space; the outer sinuous, ending on the last subcostal venule, shaded broadly beyond with brown. Discal dot rather large, faint. Hind wings concolorous with fore wings; a faint discal dot, and beyond a reddish-brown line, which disappears opposite the dot. Beneath, more tawny-reddish than above, both wings mottled with tawny and pale ash, veins tawny-reddish, the discal dots more conspicuous than above, and the two lines on fore wings very faint. No lines on hind wings.

Length of body, ♂, 0.45; of fore wing, ♂, 0.55; expanse of wings, 1.10 inches.

Denver, Colo., June 1 (T. L. Mead).

This differs from all the other species by the two blackish, shortened, sinuous lines, the outer one shaded externally, and in the body and wings being flesh-colored, almost reddish, with a faint vermilion tinge. The fore wings are rather short. The antennae are densely ciliated.

The artist has made the line on the hind wings sinuous: it should be nearly straight.

PHASIANE MELLISTRIGATA Grote. Plate 10, fig. 3.

Phasiane mellistrigata Grote, Bull. Bunale Soc. Nat. Sc., 12, pl. 1, fig. 41, 1873.

2 ♂.—Of the usual form of the genus, the apex of the anterior pair of wings moderately obtuse. Body and wings mouse-colored, slightly paler than in the other species. Fore wings with the inner line at the usual distance from the base, very slightly curved, pale tawny-brown, a narrow yellowish edging within. The outer line makes one well-marked curve, reach-

ing a point nearer the apex than the similar line in other species, whence it bends nearly at right angles on the costa; it is tawny-brown, edged on each side with yellowish, with a dark external shade, which stops at the bend; the extreme costal portion of the line being brown, and as if made up of a row of closely-connected beads. A small, transversely ovate, discal dot. No middle line. A faint marginal row of dots on both wings. Hind wings scarcely paler than the anterior pair, with a faint discal dot and a single dusky brown line, which is distinctly bent opposite the discal dot, and terminates on the costa. Under side of both wings as usual in the genus, being gray, mottled with whitish, and on the costal regions of both wings mottled with ochreous; the veins also speckled with ochreous. Legs as usual, and concolorous with the body.

Length of body, ♂, 0.47; of fore wing, ♂, 0.55; expanse of wings, 1.00 inch.

Albany, N. Y., May 29 (Lintner); Missouri (Riley).

This pretty species differs from any others I have seen by the curved outer line reaching much nearer the apex and there becoming bent at a considerable angle, and only the brown portion of the line continued on to the costa. Mr. Grote describes in his female specimen a faint median line on the fore wings, and a faint submarginal line "appearing as a vague festooning", and a single line on the hind wing distinctly bent opposite the discal dot.

The example from Missouri has the markings of the New York specimens, but the extradiscal line ends farther from the apex than usual, the line behind being a little less oblique. The wings are also darker, and of exactly the shade of *P. trifasciata*, to which the Missouri specimen shows a slight tendency to approximate; the under side of the wings in the Missouri example being scarcely distinguishable from that of *P. trifasciata*.

PHASIANE TRIFASCIATA Packard. Plate 10, fig. 4.

Phasian trifasciata Pack., Sixth Rep. Peab. Acad. Sc., 46, 1874.

1 ♂.—This species does not differ structurally from the others of the genus, except that the apex of the fore wings is perhaps slightly more rounded. Hind wings and legs as in the other species. Body and wings deep mouse-gray. Fore wings with the basal yellowish line straight. The median dusky-ash line rather diffuse, straight, and inclosing the distinct discal ringlet. The outer line almost straight, being very slightly sinuous, tawny-yellow; the

yellow portion terminates midway in a line drawn from the discal dot to the apex of the wing; from thence a dark costal continuation one-half as wide as the yellowish portion of the line. A broad dusky shade accompanies the yellow portion of the line. The outer portion of the shade is continued plainly on to the costa, running parallel to the dark end of the outer line. The usual marginal row of black dots. Hind wings with three diffuse, rather indistinct, equidistant, dusky lines, the second and third nearer together than the first and second. Discal dots small, half-way between the second and third lines. Marginal row of distinct black dots. Fringe concolorous with the wings. Beneath, discal dots distinct on both, especially so on hind wings; whiter than usual, especially the hind wings. A smoky, broad, submarginal shade on each wing free from specks. Veins and costal region of both wings speckled with ochreous. Legs speckled.

Length of body, \mathcal{L} , 0.15; of fore wings, \mathcal{L} , 0.55; expanse of wings, 1.10 inches.

Berlin Falls, N. H., August 9 (Sanborn).

This pretty species is near *P. mollistrigata*, but the fore wings are more obtuse; there are three parallel lines on the hind wings. A distinct median line on anterior pair, and the yellow portion suddenly ends, with an outer line parallel to the dark termination. Beneath, the wings are whiter.

PHASIAXE SINUATA Packard. Plate 10, fig. 5.

Phasiaxe sinuata Pack., Sixth Rep. Peab. Acad. Sci., 15, 1871.

1 \mathcal{L} .—Closely allied to but considerably larger than *P. neptata*, which it closely resembles. The antennae and palpi as in that species. Body and wings of the usual color in this genus, being mouse-ash, like *P. neptata*, and finely speckled with blackish; the specks often transversely linear. Fore wings with a curved basal line, yellowish within and tawny-brown without. The line is regularly curved instead of straight, as in *P. neptata*, and does not quite reach the costa. Discal spot large, round, situated nearer the outer than the inner line. The outer line more sinuate than usual in the genus, curving outward opposite the discal spot, and inward below the third median venule; the line is moderately broad, the inner two-thirds tawny or smull-brown, the outer dull-yellowish. A faint, dusky, diffuse line, situated half-way between the outer line and the outer edge of the wing, begins on the costa and ends in the extradiscal space. A marginal row of black dots.

Fringe concolorous with wings. Hind wings concolorous with the anterior pair, traversed by three equidistant, faint, dusky lines not reaching the costa. Fringe and marginal dots as in fore wings. Beneath, both wings quite uniformly mottled, though the hind wings are more coarsely so, with more white. Venules subochreous; costal region of both wings speckled with ochreous. Fringe slightly checkered with dusky-brown. Legs concolorous with the body.

Length of body, ♂, 0.50; of fore wing, ♂, 0.65; expanse of wings, 1.45 inches.

Victoria, Vancouver Island, July (G. R. Crotch, Mus. Comp. Zoöl.).

This species differs from *P. neptata* to which it is closely allied, in the head and cut of the wings, by its larger size, the sinuate outer line, and by the three dusky lines on the hind wings. The under side of both wings resembles closely that species.

PHASIANE SUBMINIATA Packard. Plate 10, fig. 6.

Panagya subminiata Pack., Proc. Bost. Soc. Nat. Hist., xvi, 25, 1874.

1 ♀.—Differs from any other species known to me by the vermilion-red on the costa and veins, especially beneath; the upper side of body and wings being uniform ash, tinged faintly with vermilion. Front reddish-ash, dull red on orbits; the grayish hairs projecting between the palpi well marked. Palpi stout and bushy, concolorous with the orbits, with a dark spot beneath; vertex gray, like the thorax. Antennae reddish. Fore wings reddish-ash, especially on the costa and veins. A linear, pale-brown, interrupted, curved line, ending in a wider costal spot. Discal dot distinct, brown. Outer line forming a broad sinuate shade ending just before the costa. Fringe concolorous with the rest of the wing, with a faint pale line just beyond the middle. Hind wings a little paler than fore wings, speckled with brown scales; fringe a little darker, as in fore wings. Beneath, both wings deeply tinged with vermilion, especially costa of fore pair and entire hind wings; veins vermilion; between them finely marbled with ash and brown scales. Legs tinged with reddish.

Length of body, —? (abdomen wanting); of fore wing, 0.63; expanse of wings, 1.30 inches.

Goose Lake, Siskiyou County, Cal. (J. Holleman).

This fine species, communicated by Mr. Holleman, to whom the Museum

of the Peabody Academy is indebted for a number of rare specimens from Northern California and Oregon, may at once be known by the reddish-ash upper side of the body and the vermilion color of the under side of the wings, by the absence of the usual line on the hind wings, and by the outer line on primaries being diffuse, not sharply defined as usual.

PHASIANE IRRORATA, *sp. nov.*—Plate 10, fig. 7.

4 ♀ and 1 ♂.—Fore wings subfalcate (antennae wanting); palpi of moderate length. Body and wings pale ochreous-gray, with a more luteous tinge than in any other species known to me, dusted over with dark specks. Fore wings with two well-marked pale-ochreous lines of equal width: the inner straight, often fading out before reaching the costa; the outer either straight or slightly sinuous, being in one specimen curved outward rather suddenly in the first median space, or swelling out gradually above it. Fringe on both wings concolorous with the wings. Hind wings dusted conspicuously with black, as in the anterior pair; a dark discal dot. The discal dot on the anterior wings forming a black ringlet centered with white. Beneath, a little paler than above, with finer black specks. The outer yellowish line is faintly reproduced. Both wings are distinctly speckled with black scales: the discal spot is on the fore wings, represented by a large diffuse collection of black scales, with a much smaller one on the hind wings. Abdomen of male rather long and slender. Legs with the hind tibiae swollen: hind tarsi half as long as the tibiae.

Length of body, ♂, 0.45, ♀, 0.42; of fore wing, ♂, 0.53, ♀, 0.54; expanse of wings, 1.00 inch.

San Diego, Cal. (Crotch, Mus. Comp. Zool.)

This species may be distinguished from *P. neptata* by the lighter, more clay-yellow (luteous) wings, the larger discal ringlets, the broad, pale, ochreous, nearly straight, extradiscal line, by the want of any marginal black dots, the absence of any dark shade along the extradiscal line. Midway between the extradiscal line and the edge of the wing are three obscure dark patches. Beneath, the wings are paler than above, but with no decided ochreous tinge. I cannot identify it with any of M. Guenée's species.

PHASIANE NEPTATA Packard. Plate 10, fig. 8.

Tephritis neptaria Guen., *Phal.*, ii, 99, 1857.

Panagra flavo-fasciata Pack., *Proc. Ent. Soc. Nat. Hist.*, xiii, 394, 1871.

♂ and ♀.—Uniform granite-gray, thickly speckled uniformly over the

surface of the wing: head and thorax concolorous. A slightly oblique, narrow, brown line, lined with yellow testaceous scales on inner quarter of wing, fading away on the costa. A circular, black, discal dot faintly centered with whitish. An outer oblique, slightly sinuate, yellow testaceous line, fainter on inner edge and costa of wing, lined externally with brown scales; a marginal row of triangular, intervenous, black dots. Hind wings concolorous with the anterior pair; a single straight brown line going from the outer third of the inner edge and disappearing in the middle of the wing. A faint discal dot. Beneath, uniformly speckled with gray and white scales; costa a little clearer; the diffuse discal spot indistinct. No bands or spots. Veins testaceous and distinct beneath.

I refer, with slight hesitation, a female specimen to this species from Mr. Behrens, which has the two bands on the fore wings a little farther apart, and the discal spot twice as large. These may be sexual differences. The hind wings have a diffuse discal spot, and a single, diffuse, slightly sinuous line beyond the middle of the wing, not reaching the costa. It does not re-appear beneath, though the discal dot is large and distinct.

Length of body, 0.45; fore wing, ♂, 0.56, ♀, 0.58; expanse of wings, 1.20 inches.

California (Edwards); Sanzalito, Cal. (Behrens).

Desiderata.

Teprina haliata Guen., Phal., ii, 97.—“28^{mm}. Coupe des suivantes. Ailes d'un cendré plus ou moins jaunâtre, fortement striées de gris-foncé, avec des traits terminaux arrêtés. Supérieures ayant trois taches costales noires, virgulaires, donnant naissance à des ombres transverses, grises, parallèles, obliques, dont la dernière est marquée supérieurement d'un point et d'une liture noirs, qui se lieut avec la dernière tache costale. Un trait cellulaire qui se lie avec celle du milieu. Ailes inférieures avec un simple point cellulaire gris. Antennes moniliformes, pubescentes.

“Californie. Deux ♂, envoyés par M. Lorquin.”

Teprina muscariata Guen., Phal., ii, 98.—“30^{mm}. Coupe d'*unicatcararia*. Ailes d'un gris testacé clair, finement strié de noir. Les supérieures avec deux lignes écartées, un peu plus foncées, dont la seconde (coudée) légèrement flexueuse et marquée sur la 2 d'un à quatre petits groupes d'atomes

noires, sur une éclaircie longitudinale légèrement jaunâtre. Un trait cellulaire oblong, non annelé et parfois suivi d'une ombre médiane arquée et parallèle à la première ligne. Ailes intérieures avec un point et les traces d'une ligne sinuée, plus foncées. Antennes mouilliformes, pubescentes—♀ semblable.

“Californie. Un ♂, une ♀.”

Tephрина gnophosaria Guen., Phal., ii, 99,—“25^{mm}. Ailes concolores, d'un gris-cendré fortement aspergé de noirâtre, qui s'épaissit et se teint de jaunâtre à l'endroit de lignes ordinaires, avec une série de traits noirs terminaux et une petite tache cellulaire qui, aux supérieures, est évidée et surmontée d'une liture costale. Inférieures un peu festonnées, avec la frange légèrement entrecoupée. Dessous fortement saupoudré et teinté de noirâtre au bord terminal. Front et palpes concolores.

“New York. Une ♀. Coll. Gn. Cette petite espèce, qu'on prendrait au premier abord pour une *Gnophos*, se rapproche un peu de la variété sans bandes de *rippertaria*.”

Tephрина monicaria Guen., Phal., ii, 100,—“Taille et coupe de la suivante. Ailes supérieures d'un gris-carné clair, finement strié de noir, avec un point cellulaire et la trace des deux lignes ordinaires disposées comme chez *unicatavaria*, mais punctiformes, la seconde ayant chacun des points légèrement éclairé de blanc en arrière. Espace terminal concolore, mais bordé d'une série de petits points noir. Ailes inférieures plus claires dans toute leur première moitié, avec les mêmes points terminaux, un très-petit point cellulaire et deux vestiges d'ombres vers le bord abdominal. Dessous très-claire, avec les points cellulaire et terminaux pour tout dessin. Éperons de la seconde paire égaux. Antennes à lames minces et couchées.

“Californie. Un ♂, envoi de M. Lorquin.”

Tephрина unicalcararia Guen., Phal., ii, 100,—“31^{mm}. Ailes supérieures aiguës, mais non falquées à l'apex, à bord terminal très-peu convexe, d'un gris un peu carné, fortement mais finement strié de noir, avec les deux lignes ordinaires très-écartées, mal écrites et en forme d'ombres: la seconde commençant à la côte, non loin de l'apex, mais rentrant au milieu, éclairée antérieurement de jaune-rougeâtre fondu. Tout l'espace derrière elle d'un gris-violet plus foncé. Un point cellulaire noir. Ailes inférieures arrondies, beaucoup plus claires, sans atomes et n'ayant pour tout dessin de part et d'autre, qu'un petit point cellulaire noir. Dessous des supérieures dans le même cas. Antennes à

lames longues et couchées. Tibias postérieurs n'ayant qu'un seul éperon à la place de la seconde paire.

“Californie. Un ♂, envoyé par M. Lorquin.”

Tephрина sabularia Guen., Phal., ii, 105,—“27^{mm}. Ailes d'un gris-testacé clair, finement sablé de brun, avec une série de petits points noirs terminaux et une ligne commune, finement et régulièrement ondulée, derrière laquelle est une série de points placés sur les nervures: ces points plus distincts sur les supérieures, où la ligne l'est moins. Un petit point cellulaire aux quatre ailes. Inférieures sans échancrure ni sinus. Dessous concolore, avec une bande éteinte. Tête d'un jaune de miel, y compris la pièce qui précède le collier. Palpes longs, incombants, aigus.

“Amérique du Nord. Une ♀. Coll. Guen.”

I do not feel sure that all the preceding species belong to *Phasiane*, but place them here provisionally.

Tephрина expressaria Walk., List Lep. Het. Br. Mus., xxiv, 1657, 1862.—“*Male*. Cinereous. Head with a narrow blackish band in front. Palpi short, broad, blackish on the outer side; third joint very minute. Antennae broadly pectinated, except towards the tips. Hind tibiae incrassated; spurs very short. Wings thinly and minutely brownish-speckled; interior, middle, and exterior lines blackish, undulating, hardly dentate, retracted, and dilated towards the costa of the fore wings; submarginal line whitish, zigzag; marginal points black; discal ringlet elongated, brown-bordered; under side with a brown discal streak and a brown submarginal band, which is obsolete in the hind wings. Fore wings somewhat rounded at the tips; exterior border slightly convex, very oblique. Length of the body, 5 lines; of the wings, 14 lines. *a.* Nova Scotia.” From Lieut. Redman's collection.

Tephрина? perrelata Walk., List Lep. Het. Br. Mus., xxiv, 1760, 1862.—“*Male*. Dark ferruginous-cinereous. Head dark brown. Palpi porrect, short, broad, connected; third joint extremely short. Antennae moderately pectinated, rather short. Abdomen extending a little beyond the hind wings; apical tuft quadrate. Legs rather short; hind tibiae with moderately long spurs. Wings rather narrow, thinly and minutely black-speckled; exterior line brown, slightly denticulate and undulating, very indistinct in the fore

wings: marginal space a little darker: fringe long, full. Fore wings slightly rounded at the tips: discal dot black, formed of elevated scales: exterior border slightly convex, rather oblique. Length of the body, 6 lines: of the wings, 16 lines. *a. Georgia.*"

PSAMMATODES Guenée. Plate 3, fig. 4.

Eubolia (in part) Lederer, Verh. Zool. Bot. Vereins. Wien, 37, 1855.

Psammatodes Guen., Phal., ii, 197, 1857.

Male antennæ simple, densely ciliated; in the female simple. Head and palpi much as in *Phasiane*; palpi short and stout, as in *Phasiane*, but still shorter, the second joint being broad at tip, and third joint small, short, and depressed. Fore wings much as in *Phasiane*, but the costa is not quite so straight; the apex is more rounded, less produced, and the outer edge is more convex. The hind wings are much as in *Phasiane*, being somewhat square, a little angulated at the apex and again on the first median venule. The venation differs from that of *Phasiane* in the subcostal cell being longer, in the costal vein nearly touching but not uniting with the subcostal. The two subcostal venules arise as in *Phasiane*, but are shorter and directed at a greater angle to the costa; the lower discal venule is more oblique and curved than in *Phasiane*, and the disposition of the two discal veins is more like *Semiothisa* than *Phasiane*. The form of the abdomen, which is broad at the tip, is as in *Phasiane* (male legs wanting, but Guenée states that the hind legs are not swollen). Female legs as in *Phasian*.

The above description applies to our single species, which belongs to Guenée's second section of the genus. This genus was founded by him on six species: one from Hayti, one from Catalonia, two from Syria, and one from Brazil, besides *P. cremiata*. Guenée remarks that the male antennæ are almost always furnished with long branches, while the legs are not swollen.

It is very near *Phasian*, and is distinguished from it by the less produced fore wings, the rather squarer hind wings, and the venation. The markings are much as in *Phasiane*, it having three parallel lines, the outer a little sinuous; but it differs in having two well-marked parallel lines on the hind wings. The larva is unknown.

PSAMMATODES EREMIATA Guenée. Plate 9, fig. 73.

Psammatodes eremiata Guen., Phal., ii, 109, 1857.

Walk., Lep. Het. Br. Mus., xxiii, 971, 1861.

3 ♂ and 2 ♀.—Male antennae ciliated; female simple. Body and wings uniformly soft granite-gray, with a slight pearl-colored tinge. The fore wings have three parallel brown lines, the basal angled in the discal space; the middle line is a little nearer to the basal than the outer line, which is slightly sinuous. A row of minute, dark, marginal spots. Fringe on both wings concolorous with the wings. Hind wings exactly concolorous with the anterior pair: the inner line runs very near a faint discal dot; the extradiscal line is bent slightly in the middle. Beneath, the wing is pearly-gray, mottled with small white spots, and the fringe is paler than above, finely checkered with darker. Faint discal dots present on both wings, and an outer faint line, broader than above, common to both wings.

Length of body, ♂, 0.42, ♀, 0.40; of fore wings, ♂, 0.46, ♀, 0.48; expanse of wings, 0.90–0.92 inch.

Natick, Mass., May 14 and August 2 (Stratton); Center, near Albany, N. Y., August 5 and 6 (Lintner); Ohio, Ill. (Morrison).

This moth is not uncommon, and is evidently double-brooded. It may be recognized by its close resemblance to some species of *Phasianæ*, from all of which it differs in the two brown lines on the hind wings. It differs in the same respect from any species of *Semiothisa*. From *S. ocellinata* and *S. 8-signata*, allied forms, it differs in the more obtuse fore wings, the slightly more curved costa, and the style of markings.

I am indebted to Mr. Morrison for the identification of this species.

SEMIOTHISA Hübner. Plate 3, fig. 6, 6a.

Pharmacis Hübner, (in part), Verz., 298, 1818.*Semiothisa* Hübner, (in part), Verz., 298, 1818." *Eutropa* and *Parasemia* Hübner, Beiträge."*Macaria* Curtis, Brit. Ent., vi, 132, 1836.*Ennomos* Treits., (in part), vi (i), 3, 1827.*Philobia* Dup., Lep. France, viii (iv), 195, 1829.*Macaria* Steph., Nomencl. Br. Ins., 45, 1829.

Boisd., Gen. Ind., 186, 1840.

H.-Sch., Schin. Eur., iii, 50, 1817.

Macaria Steph., Cat. Br. Lep., 227, 1850.

Guen., Phal., ii, 66, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 878, 1861.

Male antennae simple (except in *S. dislocaria*, where they are well pectinated), ciliated, rarely with rudimentary pectinations; in female, simple.

Palpi short, obtuse, not projecting far beyond the front; second joint wide, truncated at the end, the scales partially concealing the small, short, depressed third joint; a short frontal tuft between the palpi. Fore wings distinctly falcate; the costa straighter than in *Thamnonoma*; the apex more or less falcate, with usually a well-marked excavation below the apex. Hind wings either distinctly bent on the first median venule, or with a salient angle. The costal region is very narrow, much more so than in *Thamnonoma*, and the subcostal venules are usually shorter, otherwise the venation is of the same pattern as in *Thamnonoma*. In *S. ocellinata* and *californiata*, the areole is open externally. The hind wings are well rounded at the apex, very angular on the first median venule, or the angle (as in *ocellinata*) is obtuse and much less distinct; scalloped, usually distinctly, on the outer edge; the inner angle is well marked and parallel with the end of the abdomen, which latter is long and slender, though much less so than in *Thamnonoma*. Hind tibiae scarcely swollen, not much longer than the tarsi, or, as in *S. ocellinata*, they are large and much swollen, and twice as long as the tarsi. The species usually with three lines on the fore wings, and a fourth oblong, large, conspicuous spot, with a dark line on the curve under the apex.

This well-marked and wide-spread genus is usually recognized by the falcate fore wings, the distinct excavation below the apex, and the angular hind wings. From *Thamnonoma* it is distinguished by the shorter palpi and narrower costal region and simple antennae. The lower series of species merge into *Phasianæ*, the head becoming larger, the body much stouter, and the wings less falcate and angular, as in *S. ocellinata*, *californiata*, and *s-signata*.

The genus may, for convenience, be divided into three sections: A, those with the fore wings scarcely falcate, and the hind wings but slightly angular; B, those with slightly falcate wings and angular hind wings; and C, those with decidedly falcate wings and the angle in the hind wings very prominent. The species are ochreous or granite-gray, usually with a costo-apical conspicuous brown spot.

Larva.—Caterpillar quite short, without tubercles, not attenuated, marked with longitudinal lines, living exposed on trees and bushes. Chrysalids in cocoons at the surface of the earth (Guenée).

The genus *Semiothisa* was so well limited by Hübner in 1818 (only one of the seven species enumerated by him belonging to another genus) that I see no good reason why it should not be retained instead of *Macaria*.

Synopsis of the Species.

A. Fore wings entire; hind wings not angulated:

- Outer line deeply sinuous, waved. Insect tinged with ochreous *S. s-signata*.
 Outer line straight; three costal spots, succeeded by three rows of venular spots;
 pale gray *S. californiata*.
 Like *californiata*, but the antennae pectinated; a broken patch in the middle of the
 wing; hind wings with a dark line *S. dislocaria*.

B. Fore wings slightly falcate; hind wings slightly bent:

- Discal dot forming a ringlet; lines replaced by venular black dots. Pale gray... *S. ocellinata*.
 Like preceding, but subochreous, and head and prothorax reddish-ochreous..... *S. punctolineata*.
 Granite-gray; coarsely speckled; large brown costal spots, and a mesial brown
 patch under the large costo-apical patch..... *S. granitata*.

C. Fore wings decidedly falcate; hind wings with a prominent angle:

- Fore wings with seven lines; hind wings with four. Pale gray *S. multilineata*.
 Whitish, tinged with ochreous; an extreme median, eye-like, large, deep-ochreous
 patch under the brown costo-apical patch *S. enolata*.
 Same color as preceding, but with no eye-like patch, and three slight lines on fore
 wings *S. galbincata*.
 Half as large as preceding, with three lines on hind wings; very pale beneath.... *S. minorata*.
 Twice as large as *minorata*, with border of both wings dark lilac-gray; a broad,
 common, ochreous band beneath..... *S. preatomata*.
 Dark lilac-gray, with the lines blackish, and with a submarginal, chocolate, com-
 mon, brown band..... *S. distribuaria*.

SEMIOTHUSA S-SIGNATA Packard. Plate 10, fig. 9.

Macaria s-signata Pack., Fifth Rep. Peab. Acad. Sc., 63, 1-73.

6 ♂ and 4 ♀.—The outer edge of the fore wings is not excavated, and hind wings not angulated; it differs from all the other species known to me by the distinct, dark, clear sigmoid line crossing the outer third of both pairs of wings. Body and wings fawny-ash, head a little darker than the body; front of head, palpi, and antennae fawny-yellow. Fore wings densely speckled with brown, with four prominent brown spots on costa; the two inner being the termini of an indistinct row of venular dark dots, the second including the discal dot. The third line represented by a distinct s-shaped wavy black line, sometimes, but not usually, reaching the costal dot. Beyond is a broad dark shade running across the wing. Half-way between the sinuate line and the edge of the wing is a white interrupted line. The usual black points on the edge of the wing. Hind wings (usually) with a single sinuate distinct brown line crossing the wing; beyond, a broad brown shade, succeeded by an irregular whitish line often obsolete. Beneath with an ochreous tinge; densely speckled; the line faintly reproduced. Submarginal broad band distinct; discal dot on hind wing large; on fore wing it is indistinct.

Length of body, ♂, 0.43; ♀, 0.50; of fore wings, ♂, 0.45; ♀, 0.55; expanse of wings, 1.10 inches.

Texas, August 1 to September 30 (Belfrage); Dallas, Tex., July (Boll, Mus. Peab. Acad. Sci.).

Differs from any other species known to me by the conspicuous s-shaped line in outer third of fore wing.

SEMIOTHUSA CALIFORNIATA Packard. Plate 10, fig. 10.

Maceria californiana Pack., Proc. Ent. Soc. Nat. Hist., xiii, 392, 1871; xvi, 27, 1874.

Maceria pallidata Pack., Fifth Rep. Peab. Acad. Sci., 61, 1873.

♂ ♂ and ♀ ♀.—Pale whitish-gray. Orbits and palpi tinged with ochreous. Fore wings with four costal spots, from which more or less obsolete lines run in a faint series of dots across the wing; second spot the broadest, the discal dot forming a part of the line; third spot forming with a part of the line proceeding from it a large irregular s, extending to the middle of the wing, the line continuing beyond in an interrupted series of fine dots, and with a supplementary spot at the end of the s. Half-way between the s and the apex is a fourth small costal dot. Hind wings with an obscure discal spot, and a submarginal transverse shade; the wing is faintly mottled with smoky dots. Beneath, both wings with fine transverse subochreous spots; the lines appear beneath of a smoky ochreous, the third line being less sigmoid than above, as it is curved outward to the angle, and then goes obliquely and in a straight course to outer third of inner side. Discal dots distinct, as above. Hind wings with a distinct outer subochreous broad band near the edge of the wing. A row of dark dots along edge of both wings.

Length of body, ♂, 0.32; ♀, 0.40; of fore wings, ♂, 0.55; ♀, 0.48; expanse of wings, 1.00–1.10 inches.

Goose Lake, Siskiyou County, Cal. (J. Hollenman); Sanzalito, Cal., September 14 (Behrens); California (Edwards); Dallas, Tex., July (Boll); Texas, April, May, September (Belfrage); Lawrence, Kans. (Snow); Glencoe, Nebr. (G. M. Dodge).

It may be known by the s-like third costal spot, the more yellowish tint of the under side of the wings, and by the presence of an outer shade on the hind wings. The sigmoid spot is much like the bent spot in the middle of the wing in *Thamnonoma wararia*. It is a common moth west of the Mississippi, extending from Kansas to Texas, and common on the Pacific coast. It varies a good deal within these limits. In a Nebraska specimen, the extradiscal

line of dots is very distinct, and continued on to the hind wings. Certain specimens have a pale hue, with a slight yellowish tinge, and were originally described as a distinct species under the name *pallidata*. I append the original description:

3 ♂ and 2 ♀.—A pale cinereous species, with the outer edge of fore wings straight, not excavated, the hind wings rounded, not angulated. Head and palpi pale, concolorous with the body. Fore wings crossed by three rows of venular dark dots, ending in three costal larger spots, the outer row angulated just below the costa; the fourth spot beyond (usually present) wanting. A faint diffuse brownish shade beyond the outer row of dots (often wanting). Both wings speckled slightly with brown. Discal dots on both wings brown. The usual marginal row of dots. Fringe concolorous with the wings. A faint dusky diffuse band near the edge of hind wings. Beneath, the wings are heavily speckled with pale brown; costa and veins ochreous; discal dots larger and distincter than above; the outer line usually reproduced and double. A submarginal broad diffuse shade often present on hind wings.

Length of body, ♂, 0.41, ♀, 0.40; of fore wings, ♂, 0.47, ♀, 0.50 inch.

Texas, April 30 to May 23, September 15 (Belfrage).

Four of these specimens are whitish, a single female much darker, and with the submarginal band present on hind wings.

SEMIOTHISA DISLOCARIA, *sp. nov.* Plate 13, fig. 48.

This species is very similar to *S. californiata*, but differs in its larger size, the pectinated antennae, and in other respects. It is of the same color above and beneath, being slate-gray, with the veins quite prominent. The antennae are well pectinated; three heavier dark-brown costal spots than in *S. californiata*. The third spot is a little larger than the others, and nearly touches a large, dark, conspicuous patch, broken up into four spots, situated just beyond the origin of the median venules. A pale sinuous line runs from this patch to the inner edge of the wing; traces of similar lines run across the wing from the two inner costal spots. The hind wings differ from those of *S. californiata* in having a straight, dark, well-marked extradiscal line. Beneath, gray, mottled with whitish spots, much as in *S. californiata*, with traces of a diffuse pale line common to both wings.

Length of body, ♂, 0.50; of fore wing, ♂, 0.60; expanse of wings, 1.20 inches.

Waco, Tex., March 16 (Belfrage; Mus. Peab. Acad. Sc.; Coll. Meske).

SEMIOTHUSA OCTELLINATA Packard. Plate 10, fig. 11

Macaria octellinata Guen.¹¹¹, Phal. n. 53, 1857.

Walk., List Lep. Het. Pl. Mus. xxiii, 883, 1861.

Macaria duplicata Pack., Fifth Rep. Peab. Acad. Sci., 65, 1873.

3 ♂ and 3 ♀.—This species approaches the typical species of the genus in having the fore wings faintly excavated below the apex, and the hind wings distinctly angulated. In its markings and in the head being concolorous with the body, it approaches the *S. californiata*. Pale ash on the body and wings, the latter more or less dusted with darker scales. Fore wings crossed by three broad dusky bands, inclosing dark venular dots, those in the outer band being conspicuous; this outer band is usually (not always) doubled, the inner ending on the third costal spot, the outer more diffuse and ending in a fourth broader costal spot (this spot is sometimes large and diffuse, sometimes smaller than the third and quite distinct). The marginal row of dots is less interrupted than usual, forming an almost continuous line. Hind wings marked as the anterior pair, with two broad bands, inclosing a row of black spots, the outer band being doubled. Beneath, whitish-ash, with thick brown specks, an oval large discal dot on primaries centered with white, an inner line and an outer double line on both wings; the outer portion of the double brown line being wavy and three times as wide as the inner, both wings marked the same, except that the discal dot on hind wings is small and inconspicuous (in one specimen larger and more distinct).

Length of body, ♂, 0.42–0.50, ♀, 0.50; of fore wing, ♂, 0.50, ♀, 0.50; expanse of wings, 1.05 inches.

London, Canada (Saunders); Maine (Packard); Massachusetts (Sanborn); Cambridge, Mass., September 7 (Harris Coll.); West Farms, N. Y. (Angus); Brooklyn, N. Y. (Graef); New Jersey (Sachs); St. Louis, Mo., February 6 (Riley); Alabama (Grote); Illinois (Clemens); Lawrence, Kansas (Snow); Glencoe, Nebr. (G. M. Dodge).

This not uncommon species differs from all the other forms by its pale whitish-ash color, the head being scarcely darker than the body, by the fore wings being almost straight below the apex, while the hind wings are very slightly angulated, and by the outer double line, so dark and conspicuous on the under side of the wings, and also by the large oval discal ringlet. The single Alabama male is rather smaller than any of my other specimens, with all the markings very distinct.

In the Nebraska specimens (and one Illinois specimen from Mr. Morrison), the ground-color is white and the broad shade on the hind wings is wanting, and the markings consequently more distinct than in eastern ones, while the costal spots are larger, particularly the costo-apical one; and they are in some cases larger, the fore wing measuring 0.60 inch. By some, these specimens might be regarded as specifically distinct. I examined M. Guenée's type in his collection. The larva feeds in Kansas on *Robinia pseudacacia* (W. Osburn *vide* Professor Snow.)

Acidalia restorata Walk., List Lep. Het. Br. Mus., xxii, 726, 1861, from St. Domingo, is, without much doubt, judging from a colored drawing of his type, *S. ocellinata*, or a representative species.

SEMIOTHRISA PUNCTOLINEATA Packard. Plate 10, fig. 12.

Macaria punctolineata Pack., Fifth Rep. Peab. Acad. Sc., 64, 1873.

1 ♀.—This species, in its tawny-ash color, the shape of the wings, and the color of the under side, is nearer to *S. ocellinata* than any other species. It differs in the hind wings being a little angular, while the outer sinuate line is represented by a row of black dots. Body and wings tawny-ash; head, palpi, and antennae tawny-yellow; three obscure dusky tawny bands cross the fore wings, inclosing a row of black dots, those in the outer line being most marked; several black costo-apical spots, and below, in the middle of the wing, a conspicuous oblong black patch (not represented in the figure); the marginal row of black dots as usual; the same marking on hind wings, the outer dusky band a little wider than on fore wings. Beneath as above, but with a decided ochreous tinge; a common inner and outer band, the inner ochreous, the outer blackish-brown, consisting of two broad obscurely-scalloped lines, the wing beyond washed with dull deep ochreous. Discal dots more distinct than above; those on fore wings brown-ochreous, on hind wings clearer blackish.

Length of body, 0.40; of fore wing, 0.52; expanse of wings, 1.05 inches.

Texas, September 23 (Belfrage); Dallas, Texas (Boll).

Easily recognized by the fore wings not being excavated, by the tawny color, the three rows of black dots on primaries, the blackish costo-apical patch and median patch below, and by the unusually dark, distinct, broad outer band on the under side of the wings. It differs from *S. ocellinata*, which it very closely resembles, in the more produced wings, the yellow hues, and larger size.

SEMIOTHUSA GRANITATA Packard. Plate 10, fig. 13.

- Macaria granitata* Guen., Phal., ii, 85, 1857.
Tephrosia dispareta Walk.,!!!, List Lep. Het. Br. Mus., xxi, 405, 1860.
Macaria ? subapicaria Walk.,!!!, *id.* Grote, Can. Nat., vi, 49, 1861.
Macaria granitata Walk.,!!!, List Lep. Het. Br. Mus., xxiii, 883, 1861.
 halito Walk.,!!!, List Lep. Het. Br. Mus., xxiii, 885, 1861.
 ? submarmorata Walk.,!!!, List Lep. Het. Br. Mus., xxiii, 887, 1861.
? Macaria caucaspicata Walk., List Lep. Het. Br. Mus., xxiii, 889, 1861.
Macaria irregularata Walk.,!!!, List Lep. Het. Br. Mus., xxiii, 890, 1861.
 ? refusaria Walk.,!!!, List Lep. Het. Br. Mus., xxiii, 891, 1861.
Larentia ? exnotata Walk.,!!!, List Lep. Het. Br. Mus., xxiv, 1186, 1862.
Acidalia ? fuscipunctata Walk.,!!!, List Lep. Het. Br. Mus., xxvi, 1505, 1862.
Macaria reticulata Walk.,!!!, List Lep. Het. Br. Mus., xxvi, 1862.
 quadrisignata Walk.,!!!, List Lep. Het. Br. Mus., xxxv, Suppl., part v, 1665, 1866.
 ser-maculata Pack., Proc. Bost. Soc. Nat. Hist., xi, 41, 1867.
? Macaria succosata Zeller!!!, Verh. Bot. Zool. Ges. Wien, xxii, 185, 1872.
Macaria unimodaria Morrison!!!, Proc. Bost. Soc. Nat. Hist., xvi, 196, 1874.

♂ and ♀.—Antennae serrated, ciliated, the hairs radiating so that the ends of each brush touch and form a connected line: fore wings but slightly falcate, being but slightly, almost imperceptibly, excavated below the apex: hind wings angular, but the angle small, though acute: antennae, head, and prothorax chocolate-brown; orbits and anterior edge of front and end of second joint of palpi whitish: body and wings granite-gray: fore wings densely speckled with three well-marked deep chocolate-brown lines, slightly discontinuous between the veins, and sometimes rather diffuse, ending on the costa in conspicuous triangular spots: inner line regularly curved, middle nearly straight, outer sinuate and enlarged in middle, touching a large dark-brown patch broken up by the veins, somewhat as in *S. exnotata*. Above this is the usual broad costo-apical patch, sometimes irregularly oblong, or broad and rounded: from the outer side of this spot arises the submarginal zigzag white line, which differs in distinctness with the degree of cloudiness of the wing: hind wings usually thickly speckled, with a large distinct discal dot and a broad submarginal smoky band (sometimes the wing is simply uniformly speckled, with no discal spot or band): on both wings, a marginal row of black dots, while the fringe is whitish, checkered with blackish. Beneath, whiter than above, mottled with speckles, often forming quite large spots: veins and costa washed with ochreous, four large diffuse discal dots: a common broad ochreous or pale-chocolate band, the outer edge irregular, and when the band is quite perfect more or less serrate: sometimes the band is only distinctly marked on the costa, and is represented on the fore wings by a similar linear line: legs concolorous with the under side of the wings: hind tibiae long and much thickened and flattened, and tarsi short: abdomen with two dorsal rows of fine black dots.

Length of body, ♂, 0.48–0.60; ♀, 0.40; of fore wing, ♂, 0.55–0.64; ♀, 0.52–0.60; expanse of wings, 1.10–1.20 inches.

London, Canada (Saunders); Montreal, Canada (Caulfield and Lyman); Brunswick, Me., frequent, June 6 to July 10 (Packard); Mount Washington, N. H., July 8 (Sanborn); Dublin, N. H. (Leonard, Harris Coll.); Essex County, Vt., July 28 (Cassino); Boston (Sanborn and Minot, Harris Coll.); Amherst, Mass. (Goodell); Natick, Mass. (Stratton); Brookline, Mass., June, July 5 (Shurtleff); Carver, Mass., July 21 (Shurtleff); West Farms, N. Y. (Angus); Albany, May 24 to July 17 (Meske); New Jersey (Sachs); Philadelphia, Pa. (Am. Ent. Soc. Grote); Florida (Chapman, Coll. B. S. N. H.); Colorado (Mead); Victoria, Vancouver Island (Crotch).

Though this is an exceedingly variable species, yet all the specimens agree in the granite-gray, thickly-mottled wings, with the three subparallel lines ending triangularly on the costa, and the large subdivided brown patch in the middle near the outer edge of the fore wing; the broad ochreous or smoky band common to both wings beneath is usually present. It varies much in the distance between the lines. In one example from Pennsylvania, the two inner lines are very contiguous, and both very sinuous; in an example from London, Canada, received from Mr. Saunders, the ground-color is whiter than usual, and the lines and spots very heavy, and the second line runs on to the hind wings. It also varies in the cloudiness of the wings: some are whitish, with fine speckles and no lines on hind wings; others more typical are granite-gray from being so coarsely and densely speckled, with a prominent discal dot and a broad submarginal shade. When much rubbed, the costo-apical and median spots remain to indicate the species. The Floridan form does not differ from the others, except that the lines are rather heavier, and there are indications of two lines on the hind wings, on the upper side, near the inner edge. One individual was collected in Colorado by Mr. Mead. It is rather larger than specimens from Victoria, Vancouver Island, collected by Mr. G. R. Crotch, and is much darker, being much as in eastern specimens. The lines on the fore wings are rather broad, and the dark broken spot in the middle of the wing, near the outer edge, is obscure and united to form a faint patch; the hind wings are without any submarginal shade, as in some eastern examples.

I am disposed to regard my *M. sex-maculata*, from Caribou Island, Labrador, Straits of Belle Isle, as a variety of this species. It is very closely

allied to it. It is rather smaller than usual; the fore wings tinted with an obscure olive-gray, while the hind wings are uniformly ochreous brown, not mottled with whitish as usual; the costal spots on the fore wings are rather large; it chiefly differs, however, in having a large brown spot in the course of the median line next to the usual large brown spot, the two forming twin spots; beneath, it does not differ from other examples from Maine. The specimens from Norway, Me., closely resemble the Labrador form in having the inner spot much enlarged, though otherwise of the typical mode of coloration.

Two males and two females, from Vancouver Island, collected for the Museum of Comparative Zoölogy by Mr. G. R. Crotch, are rather larger than the average of our eastern specimens, with longer wings, but they do not materially differ: one specimen scarcely differs from an individual from New York. They are, however, rather whiter than usual, with the submarginal band nearly obsolete; all have the inner division of the median dark patch on the fore wing broad, thus exactly resembling the New York example, though not so well marked as in the Labrador specimens; beneath, the common, broad, submarginal band is ochreous and nearly obsolete.

It is interesting to notice how the species varies away from its apparent geographical center, the Northeastern States. In Labrador, it grows much smaller, is stunted and darker; while at Vancouver Island, about one hundred and fifty miles farther south in latitude, it grows rather larger than in the Eastern States, with the wings decidedly more elongated and paler. This species is very common in the New England States; it is closely allied to *S. signaria* of Europe. Guenée's type of *M. granitata* I did not see in his collection, but his description applies well to this common species. Having received, through the kindness of Professor Zeller, a type-specimen of his *Macaria succosata*, I find that it does not differ from the usual form of what I regard as *granitata*.

SEMIOTHUSA MULTILINEATA Packard. Plate 10, fig. 11.

Macaria multilineata Pack., Fifth Rep. Peab. Acad. Sci., 65, 1873.

2 ♂ and 1 ♀.—This species, in its narrow primaries and well-angled secondaries, is allied to the more typical species of the genus, but differs in the antennæ being subpectinated, the branches being short slender tubercles ending in a tuft of hairs. Body and wings whitish-ash; the head, palpi, and

antennae tawny-yellow. Fore wings crossed by a greater number of brown lines than usual; an inner very distinct line, sharply angled on the costa; a median faint double line ending in a single darker brown costal spot; an outer dark distinct oblique line, a little curved outward just below the costa, and swelled out suddenly on the median vein; a fainter line on each side, and externally a broad pale-brown shade, becoming more distinct toward the costa; still beyond, a whitish submarginal line, widening triangularly on the apex; the marginal dark-brown line very distinct, scarcely interrupted. Hind wings with a distinct black discal dot, a line within, and beyond a broad brown shade, bounded on each side by a darker brown line; both wings densely speckled. Beneath, marked much as above, the four lines quite distinct, the third forming a band composed of three parallel, brown, slightly wavy lines; four distinct brown lines on hind wings.

Length of body, ♂, 0.45, ♀, 0.50; fore wings, ♂, 0.60, ♀, 0.55; expanse of wings, 1.10 inches.

Massachusetts (Sauborn); Philadelphia, Pa. (Amer. Ent. Soc.); New Jersey (Sachs).

This pretty species differs from all the others in the distinct numerous brown lines and the subpectinated antennæ.

SEMIOTHISA ENOTATA Packard. Plate 10, fig. 15.

Phalana notata Cramer, Pap. Exot., 371, G.

Macaria enotata Guen., Phal., ii, 69, 1857.

Macaria amulataria Walk.!!!, List Lep. Het. Br. Mus., xxiii, 884, 1861.

Macaria enotata Walk.!!, List Lep. Het. Br. Mus., xxiii, 899, 1861.

Macaria amulataria Zeller!!!, Verh. Bot. Zool. Ges. Wien, xxii, 487, 1872.

Macaria sectomaculata Morrison!!!, Proc. Bost. Soc. Nat. Hist., xvi, 198, 1874.

5 ♂ and 4 ♀.—Fore wings very falcate, excavated below the apex more than usual, while the hind wings are slightly dentate and very much angulated, as much so as in *S. 4-signata*, the angle very acute. Antennæ flattened, serrate, ciliated. Head, prothorax, and palpi reddish-ochreous. Body and wings whitish, with a faint ochreous tinge and minute strigæ. Fore wings with three ochreous lines, varying in width, usually narrow; inner line much curved, middle sinuous, sometimes broad and diffuse, curved on the costa. Outer line straight in its course, though wavering and bent on the costa, where it is most distinct, and with distinct venular dots. A broad, oblong, apico-costal, reddish-ochreous patch, as usual, varying much in width. The distinguishing mark of the species is the large, brown, rounded spot divided into five or six portions, by the median venules, of which the inner two or three

are situated in the outer (third) line. Subapical hollow deep, fringe elsewhere concolorous with the wings, in the excavation dusky, with a deep-brown hue at base. Hind wings concolorous with the anterior pair, with two transverse lines, the outer double and with brown venular dots; the lines vary much in width and distinctness. A distinct discal dot; none on the fore wings. A marginal line of brown dots on both wings. Beneath, pale ochreous white, with scattered dark specks. Two common lines, the inner distinctly waved, the outer narrower, bent on the costa on the fore wings, and opposite the discal dot on the hind wings, and accompanied by a broad, irregular, ochreous shade, sometimes consisting of isolated patches; fringe and marginal line as on the upper side. The discal dots are large, dark, and very distinct. Legs pale, spotted with ochreous.

Length of body, ♂, 0.40–0.46, ♀, 0.40–0.45; of fore wing, ♂, 0.47–0.60, ♀, 0.52–0.60; expanse of wings, 1.25 inches.

Saskatchewan River above the Rapids, Brit. Amer., July 20 (Scudder); Brunswick, Me., frequent in the middle of June, in company with *S. bisignata*; Essex County, Vt., July 28 (Cassino); Boston, Mass. (Sanborn); Brookline, Mass., June 26 (Shurtleff); Amherst, Mass. (Goodell); Natick, Mass. (Stratton); Dedham, Mass. (F. W. Very); White Mountains, N. H., August 20 (Shurtleff, Bost. Soc. Nat. Hist.); West Farms, N. Y. (Angus); Brewsters, N. Y. (Grote); Brooklyn, N. Y. (Morrison); Oneida, N. Y. (Hawley); New Jersey (Sachs); Philadelphia, Pa. (Grote and Am. Ent. Soc.); Kansas (T. Glover, Department of Agriculture, Washington); Dallas, Tex., March and April, July to October, in bottom-lands (Boll, Mus. Peab. Acad. Sci.); "New York, East Florida" (Walker). For description of larva see Appendix.

This pretty species, with much of the form of *S. bisignata*, may be distinguished from all our other forms by the large brown spots in the middle of the outer third of the wing, subdivided by the pale venules into five or six spots. It varies a good deal in its markings. The Texan example is browner than in northern examples. I was unable to distinguish the specimen I took for comparison from M. Guenée's *M. enotata* from Northern Brazil, Amazon, and Surinam, not finding any specific differences, and shall conclude, until more material comes in from South America, that the present species is among the few *Lepidoptera* which range from Brazil to Maine. This is also so close to Walker's example of *S. enotata* from Santarem (Bates) that I should not venture to separate it. It is very closely allied to the European *Scythothus enotata*. I have examined Mr. Morrison's type, and also Professor Zeller's.

SEMIOTHUSA BISIGNATA Packard. Plate 10, fig. 16.

Macaria bisignata Walk., List Lep. Het. Br. Mus., Suppl. (v), xxxv, 1655, 1866.
Macaria galbincata Zeller, Verh. Bot. Zool. Ges. Wien, xxii, 184, 1872.

10 ♂ and 10 ♀.—Antennae of male flattened, serrate, ciliated. Fore wings as falcate as in *S. praetomata*; hind wings very much angulated, more so than in *S. praetomata*, the angle being very marked. Head, antennae, and palpi bright reddish-ochreous. Body and wings whitish-ochreous, gray, densely speckled with brown, being much paler than usual. Fore wings crossed by three brown lines, arising from moderately-sized costal spots. The inner line much curved, somewhat angular below the costa, but not enlarged on the costa. Second line arising from a rather large light-brown costal spot; it is not curved and is rather diffuse. Outer line tremulous, curved outward between the costa and median vein, darker on costa. A reddish-brown, oblong, broad costo-apical spot nearly touches the line; this spot is continued across the wing by a faint reddish shade, especially marked between the first and second median venules. Below this spot, in the middle of the wing, the marginal brown line, elsewhere interrupted, is continuous and well marked in the apical sinus. No discal dot. Fringe pale and concolorous on both wings. Hind wings with a broad doubled shade about midway between the faint discal dot and the outer edge of the wing (sometimes wanting). Beneath, whitish, with a decided ochreous tint, speckled thickly with brown. An inner and outer ochreous-brown line common to both wings; the outer line broad on the costa, and on the hind wings accompanied by an outer shade. Discal dots on both wings dark, distinct. Legs ochreous.

Length of body, ♂, 0.50, ♀, 0.43; of fore wing, ♂, 0.60, ♀, 0.64; expanse of wings, 1.20 inches.

Brunswick, Me., common from middle of June till middle of July, in hard-wood forests; White Mountains, N. H., July and August 10 (Shurtleff and Sanborn); Essex County, Vt., July 28 (Cassino); Salem, Mass. (Packard); Salem, Mass., June 8 (Cassino); Brookline, Mass., May 30 and June 26 (Shurtleff); Andover, Mass. (Sanborn); Amherst, Mass. (Goodell); Oneida, N. Y. (Hawley); West Farms, N. Y. (Angus); Ithaca, N. Y. (Smith); Albany, N. Y., June 25 (Meske).

This common northern form differs from the other species by its very angular hind wings, pale whitish-ochreous color, the three wavy lines on the fore wings, arising from slight costal enlargements; by the large, oblong, costo-

apical, reddish brown shade; the angular hind wings, and the well marked broad yellowish band common to both wings.

Professor Zeller's description is so full that there is little difficulty in recognizing his species, while Walker's was identified by a comparison with his type in the British Museum.

SEMIOTHUSA MINORATA Packard. Plate 10, fig. 17.

Macaria minorata Pack., Fifth Rep. Peab. Acad. Sci., 69, 1873.

3 ♂.—Smaller than any species known to me; the fore wings slightly excavated below the apex; hind wings angulated a little and slightly scalloped. Body and wings pale pearly-ash; head, prothorax, palpi, and antennae tawny-red. Fore wings crossed by three distinct wavy brown lines, ending in three well-marked, long, oblique costal spots, the lines being angulated outward below the costa. A broad, submarginal, diffuse, tawny rust-red shade, most distinct on the costa. A distinct dark-brown marginal line. Hind wings crossed by three distinct brown lines, of which the middle is the better marked, being much curved and wavy. Beneath paler, no rusty-tawny scales on the fore wings, and only one well-marked line just before the middle of the wing. The three lines present on hind wings, and a faint discal dot.

Length of body, ♂, 0.37; of fore wing, ♂, 0.42; expanse of wings, 0.80 inch.

Natick, Mass., June 16 (Stratton); Amherst, Mass. (L. W. Goodell); Andover, Mass. (Sanborn); Salem, Mass., June 17 (Cassino).

This is our smallest species, and somewhat resembles our common *S. bisignata* Walk., having four costal spots, of which the fourth is large, rust-tawny, while the body and wings are of much the same color. The hind wings, however, are much less angular and the lines more distinct, while the moth is very much smaller than usual.

SEMIOTHUSA PRÆATOMATA Packard. Plate 10, fig. 18.

* *Geometra præatomata* Haw., Lep. Brit., 345, 1840.

Macaria præatomata Steph., Nomenc. Br. Ins., 45, 1829.

Wood, Index Ent., 116, pl. 26, fig. 746a, 1839.

Guenée, Plod., ii, 76, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 882, 1861.

Macaria conscripta Walk., !!! *cf. id.* Grote, List Lep. Het. Br. Mus., xxii, 941, 1861.

Macaria consimilata Zeller, Verh. Bot. Zool. Ges. Wien, xxii, 483, 1872.

2 ♂.—Male antennæ broad, flattened, serrate, ciliated. Fore wings falcate; apex acute, rather more so than usual. Hind wings acutely angulated.

Head, antennae, palpi and prothorax deep reddish-ochreous. Wings and rest of body pale chocolate-brown. Fore wings pale gray on basal two-thirds, with chocolate strige, beyond the third outer line uniformly chocolate. The three lines parallel, equidistant, slightly tremulous, chocolate, marked on costa with darker spots. The oblong, deep velvety-brown costo-apical spot is long and narrow, and has a faint, ferruginous, submarginal line leading from it to the middle of the wing. A dark line edges the scallop below the apex. Fringe slightly darker than the wing. Hind wings with the same markings as anterior pair, outer half being chocolate-color, with two pale, chocolate, wavy lines, midway between which is the distinct discal dot. Outer edge bent at right angles in the middle, the angle larger than usual and acute. Beneath, uniformly deep ochreous-yellow, speckled with brown on both wings, with an inner, brown, common, sinuous line, more sinuous on hind than on fore wings, and on the latter touching the large, distinct, lunate discal dot. A parallel basal line on fore wings. An acute, broad, brown shade common to both wings, consisting of a sinuous line, with a broad shade beyond, widening toward the costa on both wings. Apical region clear yellow. Marginal black dots distinct. Fringe on both wings brown, checkered with darker. Discal dots on hind wings distinct. Legs yellowish, spotted with brown.

Length of body, ♂, 0.46, ♀, 0.40-0.50; of fore wing, ♂, 0.60, ♀, 0.50-0.63; expanse of wings, 1.20 inches.

Norway, Me. (S. I. Smith, Mus. Comp. Zool.); Brunswick, Me. (Packard); Natick, Mass., July 21 (Stratton); West Farms, N. Y. (Angus); Philadelphia, Pa. (Amer. Ent. Soc. and Grote).

This fine species, supposed by Haworth to be indigenous to England, is not very common. The acutely falcate fore wings and acutely-angled hind wings, with the broad chocolate outer margin and bright-yellow under side, separate it from any allied form.

I am indebted to Mr. Grote for the comparison of a specimen with Walker's type of *M. conspta* in the British Museum. Walker gives no locality for it. M. Guenée's type I have examined.

The specimen from Norway, Me., is much smaller than usual, and in coloration somewhat resembles *S. minorata*. It differs from those above described in having the third line on both wings unusually distinct, very wavy. The reddish-chocolate band beyond is broader, more diffuse, and much less distinctly marked on the costa. The edge of both wings is much paler.

Beneath, the common, broad, irregular blackish obsolete, and there are two well-marked, parallel wavy, rather distant lines on the hind wings, but situated much nearer the middle of the wing.

Larva.—"Caterpillar of a clear green, with the vascular system brownish and a deep-green thread under the stigmatal line. Head green with two small spots. All the feet green. It lives on different species of *Vaccinium*." Guénée.

SEMIOTHISA DISTRIBUTUARIA Packard. Plate 19, fig. 19.

Eutropa distribuaria Hübn., *Zutrläge Samml. Exot. Schmetz.* (Hüb.) 1806, fig. 755, 756, 1825.

Mecyria distribuaria Guen., *Plat.* n. 763; *M. epistemon*, pl. 3, fig. C, 1877.

Walk., *List Lep. Hb. Br. Mus.* xv. 1883, 1891.

1 ♀.—Fore wings falcate, though not quite so distinct as in *S. praeatomata*, the edges of both wings scalloped; hind wings well angulated, but the angle less produced than in *S. praeatomata*. Body and wings, above and below, dull chocolate-brown. Head, prothorax, antennae and palpi ochraceous. Fore wings with three narrow, black, parallel, equidistant lines, without the usual costal expansions: the inner regularly curved, the outer less so, and bent outward just below the costa, and again on the median veins. Beyond is a clear fawn-colored, rather diffuse band, as broad as the abdomen. The usual costo-apical oblong patch wanting. A marginal continuous black line. Fringe on both wings concolorous with the wings. Hind wings marked as the anterior pair, with but one dark line, the submarginal fawn-colored band present, and a faint discal dot. Beneath, chocolate, mottled with gray and black scales. Discal dots black, distinct. The broad fawn band common to both wings, and nearly as distinct as above. Marginal black curve is large and distinct. Fringe slightly darker than the wings. Legs concolorous with the body.

Length of body, ♀, 0.48; of fore wing, ♀, 0.69; expanse of wings, 1.27 inches.

Demopolis, Ala. (Grae); "Pennsylvania" (Hübner).

This species may be known by its general resemblance to *S. praeatomata*, though the wings are less falcate and the hind pair less angulated. It differs, however, in wanting the usual costal spots, and may be distinguished from any other species of its size by the broad, clear, fawn-colored band common to the upper and under sides of both wings. It agrees well with Hübn.'s figures, in the outline of the wings especially; but the under side of the wings of my specimens is much darker, with no yellowish tint, but pure

chocolate mixed with gray and a few black scales. I think his figures were taken from a rubbed specimen. My single female, collected by Mr. Grote in Alabama, is in a perfectly fresh state. Guenée also states that beneath the fore wings are very pale ochreous-gray. His drawing is less characteristic than Hübner's, especially as regards the outlines of the wings; but still, knowing how much rubbed specimens of this genus differ from those quite fresh, I should hesitate long before regarding my specimen as distinct from Hübner's species. My *S. minorata* is closely allied to this species in the cut of the wings and style of marking, but differs in its whitish-ochraceous under side and in wanting the broad fawn-colored band on the hind wings, and in other respects, besides its diminutive size.

Desiderata.

Geometra bicolorata Fabr., Supp., 149, 150 (*Macaria bicolorata* Guen.). Virginia. Guenée remarks: "Bien que je n'aie pas vu cette Géomètre, et que je regarde comme très-délicat de décrire des espèces sur le texte de Fabricius, la place de celle-ci me semble tellement précise, que je dérogerai cette fois à mes habitudes.

"Elle est évidemment très-voisine de *Prætomata* et *Distribuaria*, mais elle doit avoir une large bordure brune, et l'échancrure teintée de la même couleur; trois taches costales, dont la dernière oblique et plus grosse. Les inférieures ont aussi une bande brune traversée par des lignes ondulées, plus foncées."

Macaria contemptata Guen., Phal. ii, 86, 1857.—"27^{mm}. Ailes dentées, d'un gris-clair, sa poudré de brunâtre, avec les dessins noirâtres et un feston terminal, noir, découpant les dents. Ligne commune droite, suivie de dessins confus et nébuleux, et précédée, surtout aux inférieures, d'une ombre parallèle, passant au-dessus d'un point cellulaire bien noir. Supérieures arrondies et sans coude au bord terminal, ayant à la côte, près de l'apex, une liture noirâtre, éclairée de blanc extérieurement. Inférieures aussi dentées que chez *Estimaria*, mais à coude à peine sensible. Dessous blanchâtre, strié et nuagé de gris qui y forme des bandes, surtout aux inférieures.

"Amérique septentrionale. Un ♂, une ♀. Coll. Gn."

I saw the type-specimen of this species in M. Guenée's collection, and think it is distinct from any species known to me.

Macaria aquiferaria Walk., List Lep. Het. Br. Mus., xviii, 886, 1861, (plate 10, fig. 21).—“*Male*. Cinereous. Antennae serrated, pubescent. Hind tibiae incrassated; spurs short. Wings thickly brown-speckled, slightly purplish-tinged, pale luteous on the under side; interior, middle and exterior lines pale brown, nearly straight and parallel, darker and more distinct on the costa of the fore wings, accompanied by a few black points, which are most distinct on the exterior line; discal point and marginal lunules black. Fore wings acute; exterior border hardly excavated in front. Hind wings with the exterior border distinctly angular. Length of the body 6 lines; of the wings 11 lines. East Florida.”

This is a good species, and new to me. I examined the type in the British Museum. *Macaria postrema* Walk., List xviii, 887, 1861, is a rubbed *S. aquiferaria*!!!

Macaria transitaria Walk., List Lep. Het. Br. Mus., xviii, 886, 1861,—“*Male*. Brownish-cinereous. Head and fore part of the thorax ochraceous. Antennae pubescent, minutely crenulated. Wings minutely black-speckled, very slightly purplish-tinged; interior and exterior lines blackish, diffuse, indistinct; a dull ochraceous submarginal band; under side paler. Fore wings somewhat rounded at the tips; costa straight, with pale points; exterior border very slightly excavated in front; tips pale cinereous. Hind wings with the exterior border slightly angular in the middle. Length of the body $5\frac{1}{2}$ lines; of the wings 14 lines. Nearly allied to *M. liturata*. East Florida.”

At the time I visited the British Museum, I regarded this as the type of a species distinct from any of the others. It is very near the European *S. liturata*.

Macaria inextricata Walk., List Lep. Het. Br. Mus., xviii, 889, 1861,—“*Female*. Pale fawn-colour, luteous beneath. Head and fore border of the thorax dull ochraceous. Wings brown-speckled, entire, with an exterior oblique hardly undulating brown line; a brown submarginal spot opposite the middle of this line; discal point dark brown, most apparent on the under side. Fore wings acute; exterior border straight, rather oblique. Hind wings luteous; exterior border convex. Length of the body 3 lines; of the wings 10 lines. East Florida.”

This seems to be a good species.

Macaria tractata Walk., List Lep. Het. Br. Mus., xxiii, 890, 1861.—*Male*. Ochraceous-cinereous, minutely blackish-speckled. Thorax partly white on each side. Abdomen with a blackish spot on each side near the base. Hind tibiae incrassated; spurs short. Wings entire, partly white; interior and exterior lines brown, irregular; colours brighter and more conspicuously marked on the under side. Fore wings hardly acute, with two ochreous-brown streaks extending from the exterior part of the costa to the disk, where they are connected; exterior border straight. Hind wings with the exterior border forming an acute and prominent angle in the middle. Length of the body 6 lines; of the wings 14 lines. North America."

This is a valid species.

Macaria latiferrugata Walk., List, xxvi, 1640, 1862.—*Male*. Cinereous, slightly ferruginous-speckled, paler beneath. Head ferruginous. Palpi very short. Antennae minutely serrated. Fore tibiae and fore tarsi brownish, with pale bands. Wings entire; interior and exterior lines brown, hardly undulating, slightly converging hindward; interior line retracted toward the costa of the fore wings, much more slender and less conspicuous than the exterior line; space beyond the exterior line ferruginous, including the indistinct zigzag pale cinereous submarginal line, which is dilated into an apical patch; marginal line whitish, slender; fringe brown. Fore wings acute, hardly falcate; exterior border convex. Hind wings with the exterior border hardly bent in the middle. Length of the body 5? lines; of the wings 12 lines. East Florida."

This is apparently a valid species.

Macaria ?spilosaria Walk., List, xxvi, 1641, 1862.—*Female*. Brown. Palpi very short. Thorax with a black band in front. Abdomen with the hind borders of the segments whitish. Legs blackish; tarsi with whitish bands. Fore wings cinereous, with the exterior part brownish; two brown slightly undulating black-bordered bands; first basal; second interior; a denticulated slightly undulating exterior black line, followed by an incomplete line of white lunules; marginal line composed of elongated black points. Hind wings cinereous, with the lines very slightly marked. Length of the body 5 lines; of the wings 14 lines. Canada."

The type of this species is not in the British Museum.

Macaria ?sabapauria Walk., List, xxvi, 1641, 1862.—*Male*. Whitish, slender. Palpi short, slightly ascending, extending very little beyond the

front. Antennæ pubescent. Wings thickly speckled with brown; discal mark brown; marginal points black. Fore wings with four diffuse and very indistinct brown lines, which are distinguished by some obscure darkish dots and on the costa in four blackish spots; the adjoining spaces more white than the wings elsewhere. Hind wings with the exterior border angular. Length of the body 5 lines; of the wings 14 lines. "Canada."

The type of this species is also not contained in the British Museum.

Since the preceding remark was put in type I learn from Mr Grote that this species, first described in the Can. Nat. and Geol. vi. 40. 1861, is equal to Walker's *T. disparta*. It should be entered, then, as a synonym of *Semiothisa granitata*.

Macaria praxanthata Walk., List. xxvi. 1642, 1862.—"Male. Purplish cinereous, pale cinereous with a luteous tinge beneath. Head reddish. Palpi porrect, very short. Antennæ stout, minutely setulose and pubescent. Thorax ochraceous in front. Abdomen extending very little beyond the hind wings. Hind tibiae incrassated. Wings minutely black speckled, with a black discal dot; interior and exterior lines black, dentate, paler and less distinct in the hind wings; under side with the lines much more distinct. Fore wings hardly acute, with an indistinct incomplete blackish dentate middle line, and with an ochraceous band beyond the middle line; costa straight; exterior border slightly excavated in front. Hind wings with the exterior border entire. Length of the body 7 lines; of the wings 18 lines. East Florida."

Macaria laticincta Walk., List. xxiii. 885, 1861. This is a *Hyperotis*, allied to *H. alicnaria*! (Examination of type in British Museum.)

Macaria inaptata Walk., List. xxiii. 886, 1861. This is not a *Semiothisa*! (Ex. type Brit. Mus.)

Macaria impropriata Walk., List. xxiii. 888, 1861. This is a *Paraphia*, too much rubbed for identification!!! (Ex. type Brit. Mus.)

Macaria ?indeclinata Walk., List. xxiii. 888, 1861. This is *Eudropia hypochraria*! (Ex. type Brit. Mus.)

Macaria integraria Walk., List. xxiii. 889, 1861. This is *Aspitates lathoraria*! (Ex. type Brit. Mus.)

Macaria fiduciaria Walk., List. xxxv. Supplement, part v. 1651, 1866. This is not a *Semiothisa*!

EUMACARIA Packard. Plate 3, fig. 7.

Eumacaria Pack., Fifth Rep. Peab. Acad. Sc., 67, 1873.

Front rather narrow; scales rather long, closely appressed to the surface. Palpi long, narrow, ascending; a third of second joint surpassing the front; third joint minute, pointed. Antennae broadly pectinated nearly to the tip; in female, subpectinated, serrate. Thorax rather stout. Primaries: costa a little convex; apex a little produced, but much less so than usually in *Semiothisa* or *Phasiane*, slightly subfalcate; outer margin not so oblique as in *Semiothisa*, hardly excavated below the apex, rather convex in the middle. Venation much like that of *Semiothisa* and *Phasiane*; the costal vein is, however, longer, and ends beyond the subcostal areole by a distance equal to half the length of the areole, while in *Semiothisa* it ends opposite the end of the areole; the costal also connects with the areole in its middle, while in the two other genera named it joins the areole near the inner end. The first subcostal venule is longer, and the second much shorter, than in *Semiothisa* or *Phasiane*. The discal venules are as in *Semiothisa*. Secondaries with the internal angle rectangular, even with the tip of the abdomen. Apex much rounded; middle of outer margin not produced, obtusely slightly angulated, above slightly scalloped. Legs short and feeble; hind tibiae slightly swollen, the two pair of spurs not remote, slender, pointed, subequal; tarsi half as long as the tibiae. Abdomen very slender, with an anal tuft.

Coloration: cinereous, dusted thickly with brown; an outer obscure line of black spots; margin dark-brown.

By the pectinated antennae, long, slender palpi, and short, obtusely-angulated secondaries, as well as the peculiar coloration, it may be readily distinguished from *Semiothisa*. The markings and the antennae remind us more of *Epione* and allied forms than *Semiothisa*, *Phasiane*, and its allies. In the venation, it entirely differs from *Epione* and its allies. Anticipating *Epione*, etc., in the characters of the antennae and coloration, and its peculiar aspect, I am inclined to regard this as a synthetic or prophetic type, and therefore a true mimetic form, and indicating that by its present mimicry it has been preserved longer than the species possibly cotemporaneous with it.

EUMACARIA BRUNNEARIA Pack. Plate 10, fig. 22.

Eumacaria brunneata Pack., Fifth Rep. Peab. Acad. Sc., 67, 1873.

4 ♂ and 2 ♀. Pearl-ash, with chocolate-brown markings. Head, palpi, and antennae chocolate-brown. Abdomen with two rows of dorsal spots.

Fore wings crossed by three distinct brown lines, inner line with a sharp outward curve just below the costa, and below slightly sinuate; a fainter median line slightly sinuate, and not reaching as far as the conspicuous linear discal dot. The outer line is broad, firm, very slightly sinuate; beyond it the wing is chocolate-brown, with a row of large, brown, intervenular spots near the line; beyond, a narrow, faint, whitish line, widening triangularly on the apex. Fringe on both wings chocolate-brown. Hind wings marked as fore wings, though there are but two lines. Beneath, the wings pearly-whitish, checkered with the same lines as above, and with numerous strigæ, some ochreous tints mixed with the brown; a brown band outside of the third line, becoming ochreous on the hind wings; a marginal brown line, fringe brown near the apex, becoming white behind and on hind wings, and tipped with brown and narrowly marked with brown at the ends of the venules.

Length of body, ♂, 0.37, ♀, 0.35; of fore wings, ♂, 0.44-0.48, ♀, 0.46; expanse of wings, 0.90-1.00 inch.

Maine, June 9 (Packard); Massachusetts (Sanborn, Stratton); Albany, N. Y., May 25 (Lintner); New Jersey (Sachs); Texas, June 3 (Belfrage); Head of Plum Creek, Colorado, June 29 (Lieut. Carpenter, Hayden's Survey).

The larger of ten eastern and Texan specimens measures 0.48 inch on the fore wing, while the single Colorado example measures 0.53 inch. This beautiful and widely-diffused species may at once be recognized by the chocolate-brown lines and markings, the checkered under side of the wings, the two rows of abdominal dots, and the heavily-pectinated antennæ.

Subfamily CABERINÆ Guenée (emend.).

Subtribe *Cabirites* Duponchel, Cat. Lep. Eur., 267, 1844.

Cabiridi Guen. in Duponchel's Cat. Lep. Eur., 267, 1844.

Subfamily *Zerentidi* Steph. (in part), Cat. Brit. Lep., 211, 1859.

Family *Cabridæ* Guen., Phal., ii, 43, 1857.

Walk., List Lep. Rot. Br. Mus., xxiii, 839, 1861.

Head square in front and quite full or longer than broad, not very full or flat, and narrowing considerably on the front edge of the clypeal region. Male antennæ either simple or pectinated. Palpi short, slender, subaente, either not projecting beyond the front, or but slightly so. Fore wings short and broad, not subfalcate; costal edge straight or sometimes well arched; outer edge entire, full. Hind wings well rounded, not angulated, or but slightly so. Venation: usually no subcostal cell (one is present, however, in *Gaurocha* and

Corycia vestaliata, but not in *C. semiclarata*). Discal venules sometimes very oblique: in *Eudilinia*, the posterior discal venule is remarkably long and oblique, the first and second median venule arising much nearer the outer edge than usual; five or six subcostal venules. First subcostal venule often short. Hind tibiae not swollen; spurs well developed; hind tarsi well developed.

Larva and pupa.—"Caterpillars moderately long, pedunculiform, without tubercles, scarcely swollen posteriorly; head rounded, as broad as the prothoracic segment; living exposed on trees. Chrysalides contained in cocoons."—Guenée.

The moths of this group are usually pure white, or white with dark spots, or with a decided ochreous tinge.

Synopsis of the Genera.

Second subcostal venule originating within the origin of the fifth subcostal *Corycia*.
 Antennae simple; costa of fore wings very full; independent vein co-originating with the first median, making the posterior discal venule very long. *Eudilinia*.
 Antennae pectinated; second subcostal vein arising beyond the origin of the fifth subcostal. *Deilinia*.
 Antennae simple, like *Deilinia*, but a subcostal areole present, and first subcostal venule forked. *Guenéria*.
 Antennae pectinated; palpi extending beyond the head; *Acidalia*-like in the cut of the wings; costal joined with first subcostal; no areole; only five subcostal venules. *Stegania*.

CORYCIA Duponchel. Plate 3, fig. 8, 8a.

- Lomographa* Hübn. (in part), Verz., 311, 1818.
Zerene Treits., Schum. Eur., vi (ii), 217, 1828.
Corycia Dup., Lep. France, iv, 110, 1829; v, 217, 1830.
Bapta Steph., Nomencl. Br. Ins., 45, 1829; "Cat. ii, 147, 1829."
Cubera Boisf. (in part), Gen. Ind., 218, 1840.
Acidalia Boiss. (in part), Gen. Ind., 221, 1840.
Bapta R. Sch., Schum. Eur., iii, 69, 1847.
Corycia Steph., Cat. Br. Lep., 212, 1850.
Bapta Lederer (in part), Verh. Bot. Zool. Ges. Wien, 175, 198, 1853.
Corycia Guen., Phal., ii, 57, 1857.
 Walk., List Lep. Het. Br. Mus., xxiii, 871, 1861.

Head with the front square; antennae simple, flattened beneath. Palpi short and broad, slightly depressed, not reaching as far as the front; third joint minute, short, conical. Thorax moderately stout; abdomen slender, pointed at the end, not tufted. Fore wings with the costal area moderately broad; costa much arched on the basal half; apex more rectangular than in *Deilinia* or *Eudilinia*; outer edge short, not convex. Hind wings with the apex usually somewhat produced, forming a more or less distinct angle; outer edge full and rounded; inner edge forming a distinct angle. Venation some-

what of the type of *Eidonia* and *Thaumomima* rather than *Acalidia*; the costal vein touches or nearly adjoins the first subcostal venule before it bends forward to the costa, or does not bend. *Thaumomima* and goes straight to near the apex; there is no subcostal areolet in *Thaumomima*; in *Eidonia* the second subcostal venule arises within the origin of the first subcostal. *C. vestaliata*, plate 3, fig. 8, and *C. semicharata*.—Hind legs scarcely longer than nearly as long as the tibiae, which are not swollen. The species are either snow-white or white mottled with dark brown, the wings not crossed by lines.

This genus may be recognized by the arched costa, the rectangular apex, simple male antennae, conical, untufted abdomen, and the full outer edge of the hind wings, with the apex and inner angle well marked. The species differ from those of *Deilinia* in the simple antennae and the want of lines. The venation differs somewhat in the two species: the second subcostal venule arising close to the origin of the fifth subcostal, while in *vestaliata* it arises midway between it and the first; the posterior discal is very oblique in *vestaliata*, straight in *semicharata*; in one *C. vestaliata*, the fifth subcostal vein is entirely wanting!. I doubt whether Walker's *Corycia herospilata* is a *Corycia* at all.

Synopsis of Species.

Small, pure white; front entirely white; costa of fore wings beneath, smoky..... *C. vestaliata*.
Discolored with dark brown, and with four discal spots..... *C. semicharata*.

CORYCIA VESTALIATA Guenée. Plate 10, fig. 23

Corycia vestaliata Guenée, Phal., ii, 59, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 573, 1861.

Acalidia junctaria Walk., Ill. Can. Nat., vi, 39, 1861; List Lep. Het. Br. Mus., xxvi, 1593, 1861. *ph. Guen.*

10 ♂ and 10 ♀.—Fore wings distinctly rectangular at tip; outer edge of both wings rather fuller than in the following species; front rather longer and more triangular than in the two succeeding species, and the palpi rather slenderer and not extending so far out as in *herminata*, but much as in *semicharata*.—Snow-white, with no markings above, but irised; stained with brown along the under side of the costa of fore wings as far as the apex; sometimes the costa is almost entirely white beneath; fringe long, white; front of head white, palpi yellowish on the outer half; antennae white above, sometimes brownish, yellowish beneath.—Legs: fore and middle pairs with shagreening, the femora and trochantines dusky with and beneath; hind pair white.

Length of body, ♂, 0.38, ♀, 0.35; of fore wings, ♂, 0.41, ♀, 0.42; expanse of wings, 0.85–0.95 inch.

Braunswick, Me., very abundant in June, appearing as early as June 4, but more abundant a week later; it flies with a vacillating, weak flight, at dusk flying in pine-woods and open blueberry-fields about the blossoms of the wild thorn (Packard); Montreal, Canada (Lyman); Brookline, Mass., (Shurtleff); Boston, Mount Auburn, Cambridge, Mass., June 1, in meadow, on bushes (Harris Coll. Bost. Soc. Nat. Hist.); Williamstown, Mass., June 15 (Scudder); Andover, Mass. (Sanborn); Salem, Mass., June (Packard); Amherst, Mass. (L. W. Goodell); Brooklyn, N. Y. (Graef); Albany, N. Y., May 25 (Lintner); London, Canada (Saunders); Waco, Texas, April 22, June 30 (Belfrage, Mus. Peab. Acad. Sc.); Colorado (Ridings), and near the South Platte, June 28 (Lieutenant Carpenter); St. Martin's Falls, Albany River, Hudson's Bay Territory; Newton Falls, N. Y. (Walker).

This common and widely-spread species may be distinguished by its white front, which is more triangular than in *Eudeilinia herminiata*, and by the white wings. It varies in sometimes not being tinged with brown on the under side of the costa, both in examples from Maine and Texas. It is one of the earliest of our Geometrids.

CORYCIA SEMICLARATA Walker. Plate 10, fig. 24.

Corycia semiclarata Walk.!!!, Lep. Het. Br. Mus., xxv, Supplement, part v, 1653, 1866.
Bapta rivaticus Harvey, Bull. Soc. Sc. Buffalo, pl. II, fig. 6, 1874.

6 ♂ and 6 ♀.—Head square in front rather than triangular as in *vestaliata*; antennæ gray; body and fore wings whitish, suffused with gray, with two very broad, parallel, diffuse, dark-brown bands, the inner curved regularly outward and the outer sinuous; a submarginal, dark, diffuse band; a marginal row of black dots on both wings; fringe on fore wings dark, whitish at tip and on the inner angle; hind wings white, with a line of five indistinct dots parallel with the outer edge of the wing. Beneath, white; the discal dots are very large, those on the fore wings larger than those on the hind wings, and oval; an extradiscal scalloped line common to both wings, and broad on the costa; on the fore wings, a submarginal line, broad toward the costa; the marginal line of dots is connected; fringe dusky on the fore wings, white on the hind wings. Fore legs dusky; hind pair white, dark on the ends of the tarsi.

Length of body, ♂, 0.36, ♀, 0.39; of fore wing, ♂, 0.42, ♀, 0.45; expanse of wings, 0.90 inch.

London, Canada (Saunders); "Quebec" (Bélanger); Brunswick, Me., frequent in June, in company with *C. vestaliata*; Mount Washington, N. H., July (Morrison); White Mountain Valleys, July 29 (Scudder, Mus. Peab. Acad. Sc.); "Catskill Mountains" (Mead); March-April, Andover, Mass. (Sanborn); Brookline, Mass., April, May (Shurtleff); West Roxbury, Mass. (Minot); Williamstown, Mass., June 15 (Scudder); Philadelphia, Pa. (Amer. Ent. Soc.).

This characteristic form may be recognized by its stone-gray color, the three diffuse bands and dark fringe on the fore wings, which contrast with the white hind wings; also by the large dark discal dots and the two bands on the fore wings.

Desiderata.

Corycia albata Guen., Plal., ii, 58, 1857.

Walk., List Lep. Het. Br. Mus., xxvi, 573, 1861.

"Ni diffère absolument de la précédente [*Corycia herminiata*] qu'en ce que la côte des supérieures est blanche en dessous, comme tout le reste, Georgie américaine. Un ♂."

I have been unable as yet to identify this species, though I saw the type in M. Guenée's collection; but, as I saw it in the evening, (most of my comparisons were made by daylight, however), I could see no difference between this species and *vestaliata*. It may prove to be a variety either of the latter or of *E. herminiata*.

Corycia hexaspilata Walk., List Lep. Het. Br. Mus., xxxv, Suppl. 1653, 1866.—*Female*. Very pale fawn-colour. Palpi porrect, smooth, slender, not extending beyond the head. Antennae slender. Abdomen as long as the interior border of the hind wings. Legs smooth, slender. Wings broad; an indistinct, paler, postmedial, undulating line. Fore wings acute; three black costal spots; third subapical, very much smaller than the other two; fringe with brown dots; exterior border convex, slightly oblique. Length of the body 4 lines; of the wings 12 lines. North America."

EUDELLINIA, *gen. nov.* Plate 3, fig. 9.

Head with large eyes; front subscutellate, not square. Palpi slender, not reaching as far as the front. Male antennae compressed, simple. Fore wings unusually full and convex on the costa; apex obtusely rectangular, outer edge not bent; hind wings much rounded on the apex, and not bent on

the outer edge. The venation is remarkably different from that of *Corycia* and allied genera. The costal area is remarkably broad, the costal vein very straight; the first subcostal venule is straight and about two-thirds as long as the costal; the second and third subcostals are remarkably short and originate very near the apex, the second subcostal arises half-way between the apex and the origin of the fifth subcostal venule; the anterior discal venule is short and straight as usual; the posterior discal is remarkably long and very oblique, carrying the origin of the first median and independent venules out opposite to that of the fifth subcostal; the independent vein co-originate with the first median. Hind legs with slight, not swollen, tibiae; tarsi slender, and nearly as long as the tibiae. Abdomen thick; tip suddenly conical. Coloration snow-white, with two series of pale, faint, dusky spots.

This remarkable genus may be recognized by the full, arched costa of the fore wings, the simple antennae, the slight palpi, and the remarkable venation, the independent vein arising next to the first median. This abnormal character throws light on the history of this vein, and shows that it was originally a branch of the median vein. In other characters drawn from the venation, it approaches *Deilinia* rather than *Corycia*.

EUDEILINIA HERMINIATA Packard. Plate 10, fig. 25.

Corycia herminiata Guen., Phal. ii, 58, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 872, 1861.

Corycia biseriala Pack., Fifth Rep. Peab. Acad. Sc., 68, 1873.

♂.—Uniformly white. Head white; palpi dark. Fore and middle legs blackish-brown beneath. Fore wings with two rows of indistinct smoky spots on the venules; the inner regularly curved, the outer broadly sinuate, situated on the outer quarter of the wing, the inner crossing at the origin of the fourth median venule. Secondaries the same; beneath, the costa of fore wings slightly tinged with brownish at base. Two discal dots present on each wing; a dot at the origin of each discal venule.

Length of body, 0.30; length of fore wings, 0.50; expanse of wings, 1.15 inches.

West coast of Lake Winnipeg, July (S. H. Scudder); Orono, Me., July 4 (Packard); Boston, Mass. (Sanborn); Brookline, Mass., June 19 (Shurtleff); Amherst, Mass. (Peabody and Goodell); Albany, N. Y. (Lintner); Ithaca, N. Y. (Comstock); Maryland (Scudder); "Canada" (Walker).

At once recognized by its uniform pure white color and the two curved

series of smoky faint venular spots, as well as the double discal dots on the under side, one of which faintly reappears on the upper side of both pairs of wings.

Although the spotted forms which I had regarded as distinct from M. Guenée's *herminiata* do not agree with his description, as he only mentions the two black discal spots on the under side of the wings, I am inclined to unite *biscripta* with *herminiata*, as two specimens of the latter in my possession agree exactly in other respects with M. Guenée's description of *herminiata*, and *D. variolaria* is sometimes entirely white on the wings. I am also inclined to regard Guenée's *albata* as a variety of *herminiata*.

DEILINIA Hübner. Plate 3, fig. 10.

Deilinia Hübner, Verz., 310, 1-18.

Cabera Treits., (in part), Schin. Eur., vi. c., 213, 1-27.

Steph., Nomencl. Br. Ins., 44, 1-29.

Dup., (in part), Lep. France, viii (v), 5, 1-39.

Boisd., (in part), Gen. Ind., 218, 1-39.

Fidonia H.-Sch., (in part), Schin. Eur., iii, 81, 1-17.

Cabera Steph., Cat. Br. Ins., 177, 1-59.

Guen., Phal., ii, 72, 1-77.

Walk., List Lep. Het. Br. Mus., xxii, 897, 1-61.

Head with a square front; the palpi a little larger than in *Corycia*, and extending a little beyond the front; third joint a little longer than broad, pointed. Male antennae well pectinated nearly to the tips; in female, simple. Apex of fore wings as well as that of the hind wings inclined to be somewhat produced, and there is a slight angle in the outer edge of the fore and hind wings. Venation much as in *Corycia*, but the first subcostal is farther from the costal, and less sinuous than in *Corycia*; while the second subcostal arises half-way between the origin of the third and fifth subcostal venules, much as in *Acidalia*. The posterior discal venule is oblique, as in *Corycia*. Hind legs with the tibiae not much swollen, the tarsi nearly as long as the tibiae. Coloration: the wings white or ochreous, with two parallel ochreous diffuse lines, more or less distinct, common to both wings, and usually a basal line on the fore wings.

The species are distinguished from *Corycia* by the pectinated antennae, the two common lines, and the generally ochreous tint, though the females of *variolaria* are with difficulty separated from those of *Corycia*. From *Acidalia*, it differs in the pectinated antennae, the want of a decided band in the hind wings, and the larger palpi.

Synopsis of the Species.

ATLANTIC.

White; front reddish-ochreous; strige and lines brown *D. variolaria*.
 Ochreous; front ochreous; strige and lines ochreous. *D. erythemaria*.

PACIFIC.

Like *erythemaria*, but larger, and with the middle line nearer the outer than the inner line. *D. pacificaria*.

DEILINIA VARIOLARIA Packard. Plate 10, fig. 26.

Cabera variolaria Guen., Phal., ii, 56, 1857.

Walk., Lep. Het. Br. Mus., xxiii, 869, 1861.

Cabera intentaria Walk., Lep. Het. Br. Mus., xxiii, 870, 1861.

2 ♂ and 6 ♀.—Front of head deep reddish-ochreous; white on the front edge; palpi deep ochreous. Antennae white. Fore wings with the costa rather full. Both wings strigated more or less thickly with brown; sometimes the wings are pure white. In the male, the strige are arranged in two parallel lines on both wings. Beneath, pure white; sometimes a distinct black discal dot on each wing. Fore and middle legs ochreous.

Length of body, ♀, 0.37; of fore wing, ♀, 0.52; expanse of wings, 1.05 inches.

Brunswick, Me., July (Packard, Mus. Peab. Acad. Sc.); Boston, Mass. (Morrison); Dedham, Mass. (F. W. Verry); Amherst, Mass. (Prof. S. H. Peabody); Springfield, Mass., August 3 (Dimmock); Natick, Mass., August 2 (Stratton); Belmont, Mass., August 3 (Morrison); Albany, N. Y., July 24, September 15 (Lintner); Ithaca, N. Y. (Comstock); New Jersey (Sachs); Detroit, Mich. (Swartz, Mus. Comp. Zool.); Lansing, Mich. (Miles, Mus. Peab. Acad. Sc.); "Pennsylvania" (Guenée); "St. Martin's Falls, H. B. T.; New York" (Walker).

This pretty species differs from the two next in the white wings, often without lines, and the deep reddish-ochreous front.

DEILINIA ERYTHEMARIA Packard. Plate 10, fig. 27.

Cabera erythemaria Guen., Phal., ii, 56, 1857.

Walk., Lep. Het. Br. Mus., xxiii, 869, 1861.

Larger than *D. variolaria*, otherwise much the same. Head and body pale ochreous; front of head pale ochreous, white on anterior edge. Wings whitish-ochreous, with two diffuse ochreous lines common to each pair; on the fore wings, a basal similar line, bent below the costa. The middle line is

nearer the basal than the extradiscal. Both wings are strigated with ochreous. Beneath, a little clearer than above, with no lines; the extradiscal line faintly reproduced toward the costa; no other markings on the under side of the wings in either sex.

Length of body, ♂, 0.40, ♀, 0.38; of fore wing, ♂, 0.47, ♀, 0.53; expanse of wings, 1.05 inches.

Augusta, Me. (F. L. Scribner, Mus. Peab. Acad. Sc.); Brunswick, Me., June 16, not very common, (Packard, Mus. Peab. Acad. Sc.); Essex County, Vt. (Cassino); Andover, Mass. (Sanborn); Natick, Mass. (Stratton); Cambridge, Mass., and Mount Washington, N. H., July (Morrison); Pennsylvania (Gueneé); "St. Martin's Falls, H. B. T."; Nova Scotia; Trenton Falls, N. Y." (Walker).

This species may be recognized by the pale ochreous tint of the wings, by the three lines on the fore wings, with the middle one nearer the basal than the extradiscal, and by the absence of any markings or submarginal row of dots.

DEILINIA PACIFICARIA, *sp. nov.* Plate 10, fig. 28.

2 ♂.—This species is very closely allied to *D. erythemaria*, and only differs from it in its larger size and the more ochreous front, the anterior edge not being whitish, and in the more distinct markings on the wings. It also differs in the fact that the middle line on the fore wings is nearer the extradiscal than the basal. There are traces of two common lines on the under side of the wings, the extradiscal being heavy and dark on the costa.

Length of body, ♂, 0.45; of fore wing, ♀, 0.60; expanse of wings, 1.12 inches.

Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.).

GUENERIA, *gen. nov.* Plate 3, fig. 11.

This genus is nearer *Deilinia* than any other of the subfamily; the front is, however, narrower, while the palpi are the same. Male antennae simple, compressed; in the female, simple, round. The wings are of the same shape as in *Deilinia*, though the apex of the fore wings is a little more acute. There is a slight angle in the outer edge of both wings, much as in *Deilinia*, and the markings on them are much the same. In venation, *Gueneria* differs from *Deilinia* in the presence of a subcostal areole; beyond it, the first subcostal

venule subdivides; the second subcostal venule, as it were, separates from its origin with its main vein, and arising from the first alut half-way between the areole and the costal edge; otherwise the venation is much as in *Deilinia*. It also differs remarkably in the large, swollen, hind tibiae, and the short, small tarsi, which are only half as long as the tibiae. This remarkable genus is an interesting synthetic type, combining the characters of *Deilinia* and *Acidalia*, having the head and palpi of the former with the hind legs of the latter, while in the venation it differs from *Deilinia* in the presence of a subcostal areole, in which it is also allied to *Acidalia*. The species may be recognized by their close resemblance to those of *Deilinia*.

It gives me pleasure to dedicate this remarkable genus to M. Guenée, to whom American entomologists are under lasting obligations for his contributions to American lepidopterology.

GUENERIA BASIATA Packard. Plate 10, fig. 29.

Eltopia basiaris Walk., List Lep. Het. Br. Mus., xxvi, 1502, 1862.

10 ♂ and 8 ♀.—Body and wings pale ochreous, with ochreous strigæ, much as in *Deilinia erythemaria*. Front of the head ochreous; antennæ and palpi ochreous. Both wings with a single, wavy, fine, ochreous, common line. There are faint traces of two inner lines on the fore wings, much as in *Deilinia*, and of a single inner line on the hind wings; but these lines are often nearly obsolete. Beneath, a little paler than above; four discal dots, those on the hind wings much larger and more distinct than those on the front wings. A submarginal row of distinct venular dots parallel with the outer edge of the wing. Fore legs ochreous; hind legs white.

Length of body, ♂, 0.40, ♀, 0.40; of fore wing, ♂, 0.50, ♀, 0.50–0.55; expanse of wings, 1.05–1.15 inches.

Montreal, Canada (Lyman); Brunswick, Me., very common, June 8 to July 10 (Packard, Mus. Peab. Acad. Sc.); Essex County, Vt. (Cassino); Salem, Mass., July 13 (Cassino); Boston, Mass. (Sanborn and Morrison); Amherst, Mass. (H. W. Goodell); Springfield, Mass., June 5–21 (Dimmock); Mount Tom, Holyoke, Mass., July 2 (Morrison); West Farms, N. Y. (Angus); Ithaca, N. Y. (Smith).

This is one of our most common moths, flying in pine-woods and adjoining fields in June and July. It may be distinguished at once from the species of *Deilinia* by the series of venular dots and the discal dots on the under

side of the wings. All the markings are often wanting in cabinet specimens, and it varies in much the same way as the species of *Dolichota*. I have identified this species by a drawing made from Mr. Walker's type in the British Museum.

STEGANIA Guenée. Plate 3, fig. 12.

Anagoga Hübn. (in part), Verz., 294, 1815.

Tomogrypha Hübn. (in part), Verz., 311, 1815.

Eulonia Treits. (in part), Schm. Eur., vi (1), 262, 1827.

Bradycephus Steph. (in part), Nomencl. B. Ins., 14, 1829; "Cat.", ii, 128, 1829*.

Cabera Boid. (in part), Gen. Ins., 218, 1849.

Stegania Guen., MS. in Duponchel's Cat., 270, 1844.

H. Sch., Schm. Eur., iii, 70, 1847.

Steph., Cat. Br. Lep., 299, 1870.

Terpromita Lederer, Verh. Bot. Zool. Ges. Wien, 19, 1853.

Stegania Guen., Phil., ii, 43, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 1861.

Head with full eyes, and front not very wide. Palpi long and large, extending one-third their length beyond the front; third joint rather long and large, obtuse at tip. Male antennae well pectinated. Fore wings: costa straight, arched toward the apex, which is subfalcate; outer edge oblique, much less convex than in the other genera of this subfamily. Hind wings much as in *Acidalia*, being square, with a well-marked angle in the median edge, the apex being short and much rounded. Venation: the costal vein joins the first subcostal by a very short transverse vein. There is no subcostal areole; the first subcostal venule runs parallel with the subcostal main vein until it reaches the origin of the fourth venule (what is usually the fifth, for there are but five subcostal venules), where it diverges to the costal edge. The posterior discal venule is v-shaped, and sends a fold inward. Hind legs long and slender; tibiae slender; tarsi slender, two-thirds as long as the tibiae. Coloration: white in our American species, with deep-ochreous costal spots and broken lines.

This genus combines the characters of the *Caberinae* and *Acidalinae*, approaching the latter in the slightly subfalcate fore wings and angular hind wings and the general points in venation, while it differs from the others of its group in the more heavily-pectinated antennae, the large palpi extending farther beyond the front than usual, and the absence of one of the anterior subcostal venules.

Our *S. pastularia* is quite near the European *S. dilectaria*, which is ochreous, lined and dusted with brown.

* Lederer dropped Guenée's name *Stegania* because *Stegana* was previously used for a genus of Diptera; but this is scarcely a sufficient reason.

STEGANIA PUSTULARIA Guenée. Plate 10, fig. 30. Larva, Pl. 13, fig. 33; pupa, 33*a*.

Stegania pustularia Guen., Phal., ii, 49, pl. 17, fig. 9, 1857.

Walk., Lep. Het. Br. Mus., xxiii, 862, 1861.

5 ♂ and 5 ♀.—Body and wings pure white; palpi and antennae ochreous. Fore wings pure white, with four well-marked, costal, deep-ochreous spots, from the three inner of which arise slender ochreous lines. The basal line is much bent below the costa, and a little wavy; the middle line is usually wanting; the extradiscal line is bent outward in the discal space; it is sometimes broken up into spots and often wanting. A few fine dots proceed toward the middle of the wing from the fourth costal spot, but very rarely. A marginal row of fine deep-ochreous spots. Hind wings with a single deep-ochreous thread-line. Abdomen pure white. Fore and middle legs tinged with ochreous; hind legs white.

Length of body, ♂, 0.42, ♀, 0.40; of fore wing, ♂, 0.48, ♀, 0.54; expanse of wings, 1.10 inches.

London, Canada, July 4 (Saunders); Montreal, Canada (Lyman); Northern Maine, August, in woods (Packard); White Mountains, N. H., August 16 (Shurtleff); New Hampshire (Dodge); Brookline, Mass., August 16 (Shurtleff); Amherst, Mass. (Goodell); Natick, Mass. (Stratton); Boston, Mass. (Sanborn); Albany, N. Y., August 8-17 (Lintner); West Farms, N. Y. (Angus); Brooklyn, N. Y. (Graef); New Jersey (Sachs); Philadelphia, Pa. (Grote and Amer. Ent. Soc.).

This pretty species may be recognized by its white body and wings, and four deep golden-ochreous costal spots, with usually a basal and extradiscal line. The lines are often wanting; and, in one example received from Mr. Lintner, there are only two (third and fourth) costal spots and faint traces of a common line.

Larva.—"The larva of this little delicate-looking geometric moth feeds on the maple. It is common in our neighborhood, and may be readily got, in season, by striking the branches of the trees a sharp blow, when it drops at once part way to the ground, remaining suspended by a silken thread, by means of which, when danger passes, it can regain its position on the tree. It is found full-grown about the middle of June, enters the chrysalis state within a few days afterwards, and produces the moth early in July.

"When full-grown, the larva measures about five-eighths of an inch in length, body cylindrical.

"Head medium-sized, rather flat in front, slightly bilobed, and of a pale green color, with a few very fine hairs, invisible without a magnifying glass, scattered over its surface; mandibles tipped with black.

"Body above bluish green, with thickly set longitudinal stripes of whitish and yellowish. A double whitish dorsal line, with bordering lines of yellowish-white, neither of which are unbroken, but are formed of a succession of short lines and dots. Below these, on each side, are two or three imperfect white lines, made up of short streaks, and much fainter than those bordering the dorsal line; spaces between the segments yellowish. The skin all over the body is much wrinkled and folded.

"The under surface is green, with a tinge of yellowish between the segments; feet yellowish-green, prolegs green faintly tipped with brown.

"The moth is of a pure white color, with three or four reddish-brown spots on the costal margin of each of the fore wings, and with a faint curved line of the same, crossing them a little beyond the middle; it expands one inch."—W. Saunders, *Canadian Entomologist*, iii, 225.

Pupa.—Of the usual conical-oval shape. The wings reach to the hinder edge of the fourth abdominal segment. The end of the abdomen terminates, as usual, in a stout spine. Length, 0.50 inch.

Desideratum.

Stegania? quadrinotata Walk., List Lep. Het. Br. Mus., xxiv, page 1759, 1862.—*Male*. Pale cinerous-testaceous. Palpi porrect, acute, not extending beyond the head; antennae setulose. Abdomen not extending beyond the hind wings. Hind tibiae not incrassated; spurs rather long. Wings moderately broad; fore wings slightly acute, with three brown costal spots; exterior border convex, rather oblique.

Length of the body, 4 lines; of the wings, 12 lines.

New York (in Mr. Saunders's collection).

Subfamily GONIACTIDALINÆ.

Head short and very broad. Palpi slender. Antennae simple. Fore wings entire or variously notched; hind wings tridentate or entire. Venation: from three to six subcostal veins. Independent veins co-originating with the anterior discal venule. Hind tibiae swollen; tarsi two-thirds as long as tibiae.

Of the larval forms of this remarkable group we as yet know nothing.

The species are rare, and the genera may be readily recognized by the singularity of their forms.

Synopsis of the Genera.

Wings very oblong, angular; hind wings entire..... *Goniacidalia*.
 Costa of fore wings very convex; outer edge deeply excavated; hind wings tridentate... *Callopteryx*.
 Fore wings entire; apex much rounded; hind wings tridentate..... *Callizia*.

GONIACIDALIA Packard. Plate 3, fig. 13.

Goniacidalia Pack., Fifth Rep. Peab. Acad. Sc., 68, 1873.

Head and legs as in *Acidalia*, the antennae in the male slightly ciliated; in the female simple. Palpi very short, as in *Acidalia*. This singular genus may at once be recognized by the oblong primaries, the apex being prolonged, while the inner angle is elongated into a blunt, rounded, aborted tail, making the wing as broad near the base as near the apex, and beyond the "tail" the inner edge is exactly parallel to the costal. The outer edge is short and straight, less oblique than in the narrow-winged species of *Acidalia*. The hind wings are still more grotesque than the primaries, appearing as if crumpled up from not having properly expanded after the moth had left the pupa. They are so deeply notched in the inner part of the outer edge of the wing as to appear bifurcate, sending the inner fork, which is acute, nearly as far as the tip of the abdomen, while the outer half of the wing forms the other fork. The inner edge of the wing is much revolute, and near the base of the inner fork carries a crest of fine inrolled hairs. The venation is very remarkable. There is a subcostal cell and but three subcostal veins, the main vein branching but three times; the usual two subapical veins wanting. The independent vein is thrown off from the base of the anterior discal veins. The third median vein is very short, and its origin is very remote from the first two.

GONIACIDALIA FURCIFERATA Packard. Plate 10, fig. 31.

Goniacidalia furcifera Pack., Fifth Rep. Peab. Acad. Sc., 68, 1873.

2 ♂ and 1 ♀.—Brick-red; head with front and palpi red; vertex and antennae dull yellowish. Fore wings reddish, with a broad, median, yellowish patch, not reaching to the inner edge, and extending to the base of wing, interrupted by a basal reddish line; costa reddish as far as the middle of the wing. This yellowish area is centered with the reddish-brown discal dot. Outer margin of the wing paler, with a submarginal, yellowish, zigzag line, not reaching any farther than the basal yellowish patch. Hind wings pale reddish; rev-

olute edge yellowish, including the brush of hairs. — Beneath, much as above, but paler, the wing beyond the middle being crossed by a broad reddish shade, and yellowish on each side, including the apex. — Hind wings with two parallel yellowish lines.

Length of body, ♂, 0.23, ♀, 0.24; of fore wings, ♂, 0.28, ♀, 0.28; expanse of wings, 0.60 inch.

Texas, August and September (Bellinger).

CALLEDAPTERYX Grote. — Plate 3, fig. 11.

Calledapteryx Grote, Trans. Amer. Ent. Soc., ii, 119, 1848.

♂ and ♀.—Head much as in *Acidalia*, being short, small, and the front rather wide, subtriangular. Male antennae simple, very slightly flattened. Palpi slender, slightly upcurved, pointed, projecting a little beyond the front. Fore wings with the costa very much arched, the apex being very falcate; below the apex, the outer edge is deeply and regularly excavated, with a sub-acute angle between the first and second median venules; the inner angle is sharply rectangular, and the inner edge is deeply sinuate. The hind wing is oblong; below the apex, produced into a long, very acute point, below which the wing is deeply hollowed, with a small acute tooth near the middle of the hollow; a broad acute angle on the first median venule; inner angle rectangular. Venation: six subcostal branches, the independent forming a seventh, as it co-originate with the origin of the anterior discal venule. The first three subcostal venules originate near together, and some distance before the origin of the anterior discal venule. The remaining venules are very straight, not arched as in *Callizetta*. The internal vein is very sinuate. Abdomen short and thick. Hind legs stout; tibiae swollen, with large unequal spines; tarsi two-thirds as long as the tibiae. The single species known is dull ochreous, with two nearly parallel lines, and dark patches on the hollows of the outer and inner edges.

This singular genus may be at once recognized by the deeply-hollowed falcate fore wings, with the deeply sinuate inner edge, and by the deeply-notched, tridentate, outer edge of the hind wings.

CALLEDAPTERYX DRYOPTERATA Grote. — Plate 10, fig. 32.

Calledapteryx dryopterata Grote, Trans. Amer. Ent. Soc., iii, 129, 1868.

2 ♂ and 3 ♀.—Body and wings dull ochreous. Head brown in front. Fore wings with a broad dark shade, limited very distinctly on each side by

brown lines; the inner line begins considerably within the middle of the costa, and curves outward (the curve very deep), and ends in a large, dark, oblong patch just beyond the middle of the inner edge. The outer line is much less curved, and is situated midway between the inner line and the outer edge. The deep, regularly rounded, subapical sinus is bordered with brown, and there is a short, brown, linear, transverse streak on the inner edge, midway between the inner angle and the black patch. Hind wings with two fine, brown, parallel lines, both bent at a right angle in the middle of the wing. A black dot at the base of the third point. Beneath, clear ochreous, paler than above, with no markings except fine scattered strigæ.

Length of body, ♂, 0.25, ♀, 0.25; of fore wing, ♂, 0.38, ♀, 0.38; expanse of wings, 0.75 inch.

West Farms, N. Y. (Angus, Mus. Peab. Acad. Sc.); Demopolis, Ala. (Grote).

This singular moth, with the peculiar cut of the wing, is so unlike any other that it will be easily recognized.

CALLAZZIA, *nov. gen.*

Body short and thick; head short, very broad, much as in *Calledapteryx*, but the front is much broader. Male antennæ simple, a little compressed, finely ciliated. Palpi as in *Calledapteryx*. Fore wings entire, subfalcate, but the costal edge much arched, the apex being much rounded; outer edge oblique, but entire, with a faint angle in the middle. Hind wings with a deep hollow in the outer edge, armed with three unequal acute teeth, the middle tooth being smaller than the others and situated near the middle of the hollow. The teeth are much smaller than in *Calledapteryx*, and the inner angle is less rectangular. Venation: three very long subcostal veins arising near the inner fourth of the wing, as in *Calledapteryx*, the third subdividing, forming a short apical fork. The fifth subcostal venule is thrown off on the inner third of the sixth subcostal; while in *Calledapteryx* it arises in the middle. The internal vein is as straight as usual. Abdomen short and thick. Hind legs short and thick; tibiae swollen, with large unequal spurs; tarsi two-thirds as long as the tibiae.

The single species known is pearl-gray, gaily marked with dark, distinct lines.

This beautiful genus may be recognized by the broad, short head, the

much-rounded apex of the fore wings, the costa being very convex, and by the notched, tridentate hind wings and the delicate ground color and markings.

CALLIZZIA AMORATA, *sp. nov.* Plate 10, fig. 33.

♂ *♂*.—Body and wings uniformly pearly-ash. Front dark chocolate-brown. Fore wings with two dark lines, which arise wide apart on the costa, curve outward, and unite just behind the third median vein, and then form a triangular inclosure on the inner edge of the wing. Just below the apex is a dark, triangular inclosure, limited by a distinct brown line, the apex obtuse and directed toward the base of the wing. Fringe slightly checkered with brown, otherwise concolorous with the wing. Both wings with scattered brown strigæ. Hind wings with two subparallel dark lines, the inner quite regularly curved, the outer with a large, sharp angle in the middle of the wing. A few marginal dark dots on the outer edge near the last point. Beneath, dull pearl-brown ash, with no markings, but a few fine, scattered, dark strigæ. Legs a little more dusky than the wings.

Length of body, ♂, 0.25; of fore wing, ♂, 0.40; expanse of wings, 0.85 inch.

Quebec (Rev. F. X. Bêlanger); Montreal, Canada (Lyman); Albany, N. Y. (Lintner).

This beautiful and singular species may be recognized by its three-toothed hind wings, the anterior pair being entire, by its delicate pearl-ash tint, and the meeting and separating of the two lines forming a large triangle on the inner edge of the hind wings; also by the large acute angle made by the outer line on the hind wings.

Subfamily ACIDALINÆ Stephens (emend.).

Subtribe *Acidalites* Dup., Cat. Lep. Eur., 251, 1844.

Subfamily *Melanthidi* (in part), *Acidaliidæ* (p. 213) Steph., Cat. Brit. Lep., 218, and *Timauchidi* (in part) Steph., Cat., 225, 1850.

Family *Acidalida* Guen., Phal., i, 122, 1855.

Walk., List Lep. Het. Br. Mus., xxiii, 757, 1831.

Head usually short, and broad in front. Palpi usually short and weak, extending but slightly beyond the front. Antennæ usually simple (sometimes pectinated). Fore wings usually slightly subfalcate. Hind wings a little bent on the outer edge. Venation: usually a subcostal cell (sometimes two); the first subcostal venule is usually very long, originating at the subcostal cell.

Abdomen long and slender. Hind legs in some species with swollen tibiae without spurs: the tarsi in such cases very short.

Larva and pupa.—"Caterpillars slender, without tubercles, cylindrical or carinated; with the head as broad as the prothoracic ring; living concealed under low plants. Chrysalides cylindrico-conical, brown, contained in cocoons under *debris*, or in the earth."—Guenée.

Synopsis of the Genera.

A. Antennae pectinated:

Antennae broadly pectinated: wings very angular.....*Calothyrsanis*.

B. Antennae simple: first subcostal venule very long:

Wings very long: two subcostal cells: the independent vein nearer the subcostal vein than usual.....*Euacidalia*.

Wings very long: fore wings triangular; one subcostal cell: head broader in front than in *Acidalia*.....*Eois*.

Hind wings angular: palpi very long: two subcostal cells: abdomen longer and slenderer than usual.....*Ceratodalia*.

Fore wings with costal region broad: costa arched: hind wings much rounded.....*Asthena*.

Wings slightly angulated: palpi short: a single subcostal cell (two in *ossulata*).....*Acidalia*.

C. Antennae pectinated on basal two-thirds:

Head broad: first subcostal venule short.....*Ephyra*.

Like *Ephyra*, but wings scalloped.....*Eucphyra*.

CALOTHYRSANIS Hübner. Plate 3, fig. 18.

Calothyrsanis (in part) Hübner, Verz., 391, 1818.

Euomus Treits. (in part), Schin. Eur., vi (1), 3, 1827.

Pimandria Dupl., Lep. France, vii (iv), 224, 1829.

Boisd., Gen. Ind., 227, 1840.

Bredyepetes (in part) Steph., Nomencl. Br. Ins., 41, 1829.

Acidalia H.-Sch. (in part), Schin. Eur., iii, 12, 1847.

Pimandria Lederer, Verh. Bot. Zool. Ges. Wien, 194, 1853.

Guen., Phal., ii, 1, 1857.

Walk., Lep. Het. Br. Mus., xxiii, 797, 1861.

Body long and slender. Head longer than in *Acidalia*; front very long and full, broad, where that of *Acidalia* is narrow and sunken between the eyes. Antennae of the male broadly pectinated, plumose. Palpi long and slender, extending well beyond the head; third joint very long and slender. Eyes not so large and full as in *Acidalia*. Wings large; fore wings falcate, costa very full apex sharp, outer edge much hollowed below the apex, scalloped: hind wings square, the angle in the middle of outer edge produced into a long sharp point, the edge scalloped, inner angle square. Venation: much as in *Acidalia*, the subcostal cell longer and the outer end squarish, the first sub-

costal venule arising remotely from its vein; in *Acidalia*, the venule arises directly from it, the end of the cell being acute. Legs very long and slender. Hind legs very long; tibiae not swollen; spurs long; tarsi nearly as long as the tibiae. Abdomen reaching beyond the hind angle. Coloration: brownish-ochreous, with darker lines, the extradiscal sometimes broadly shaded.

This genus may at once be known by the plumose male antennae, the falcate fore wings and very acutely-angled hind wings.

Larva and pupa.—"Caterpillars carinated on the sides, much swollen on the fourth segment; head small, a little squarish; living concealed under low plants. Chrysalides slender, swollen beneath, with the head prolonged into a point; resting between leaves."—Gueneé.

CALOTHYSANIS AMATURARIA Packard. Plate 10, fig. 34.

Timandra amaturaria Walker, Lep. Het. Br. Mus., xxxv, 1634, 1835.

7 ♂ and 2 ♀.—Pale fawn; vertex a little paler; front a little darker; antennae of the same color with the rest of the body. Fore wings dusted with scattered brown specks; three dull-pink, often brownish, lines on the fore wing; inner oblique, curved hair-line in the middle of the wing; a slight transverse discal dot; an outer oblique line going straight from the middle of the inner margin to near the apex, where it almost touches the submarginal line, and is then curved back upon the costa, becoming much narrower and almost obsolete; the submarginal line slenderer than the outer line, and sinuate, having a great curve a little below the middle of the wing; toward the apex it becomes oblique, dark, uncurved, and appears as if the continuation of the outer line; edge of wing deep pink, fringe pale, interrupted at ends of venules with pink spots. Two similar lines on hind wings; basal sometimes broader than outer, slightly curved, sometimes straight; outer line parallel with it, a little curved; edge of wing and fringe as in fore wing; beneath, slightly paler than above, and flecked with large transverse pink specks; discal dot transverse; lines as above, but deeper pink. In some specimens, the lines appear dull and faded into brown. Female larger (inner line wanting in one rubbed specimen), with the outer line more angulated in middle of the wing than in the male. The deep pink-brown of the wings and lines in some cases becomes dull, almost pure brown.

Length of body, ♂, 0.25; of fore wing, ♂, 0.50, ♀, 0.66; expanse of wings, 1.05–1.32 inches.

Albany, N. Y. (Lintner); Philadelphia, Pa. (Ent. Soc., and Clemens); Illinois (Clemens); Alabama (Grote); Dallas, Tex., May 17 to June 26, not very rare (Boll, Mus. Peab. Acad. Sc.); Maryland (Mus. Comp. Zööl.); Lawrence, Kans. (Professor Snow).

At once known by the falcate wings and pink lines and specks on the under side.

In one specimen from Texas, the extradiscal line forms a broad brown shade on both wings.

EUACIDALIA Packard. Plate 3, fig. 15.

Euacidalia Pack., Fifth Rep. Peab. Acad. Sc., 69, 1873.

Though the head and legs are much as in *Acidalia*, yet the wings are so much elongated, especially the hinder pair, that the species to be described below must form the type of a distinct genus. Head much as in *Acidalia*, the front being rather wide and flat; palpi short and small; male antennae slightly denticulated and densely ciliated; in female, simple. Fore wings long and narrow, much produced toward the apex; outer edge very oblique. Hind wings very long and narrow, oblong, not reaching when expanded the end of the abdomen, with sometimes a deep notch in outer edge. The venation differs from that of *Acidalia* in the presence of two subcostal cells. The independent vein is nearer the subcostal vein than usual. Legs as in *Acidalia*.

The two species known differ from those of *Acidalia* in the long, narrow wings, and rounded hind pair; while they differ from *Eois* in having two subcostal cells. The coloration is not very uniform, one species being pale brown with dark fine lines, and the other ornamented with bright pink bands.

Synopsis of the Species.

Silky-gray	<i>E. sericeata.</i>
Banded with pink	<i>E. floridata.</i>

EUACIDALIA SERICEATA Packard, Plate 10, fig. 35.

Euacidalia sericearia Pack., Fifth Rep. Peab. Acad. Sc., 69, 1873.

3 ♂ and 1 ♀.—Uniform glossy ash-gray. Vertex of head and antennae white; front and palpi dark brown. Fore wings with an inner line formed of three dark spots, one on subcostal, one on median, and the third on submedian vein, and all situated on inner third of wing, the subcostal spot much

larger than the others; an outer, straight, dark, very slightly-interrupted line, parallel with the outer edge. Fringe concolorous with the wings, a dark line at base. Hind wings with no markings; concolorous with primaries. No discal dots on either wing. Beneath, as above, with a common dark line, straight on fore, much curved on hind wings. Fringe, especially on hind wings, with six dark spots.

Length of body, ♂, 0.30, ♀, 0.23; of fore wings, ♂, 0.35, ♀, 0.27; expanse of wings, 0.77 inch.

Demopolis, Ala. (Grote); Texas, May 10 to July (Belfrage); Dallas, Tex., July 7 (Boll, Mus. Peab. Acad. Sc.).

This interesting form may at once be known by the long wings, the hinder pair being notched, and by the dull silky-gray color.

EVACIDALIA FLORIDATA, *sp. nov.* Plate 10, fig. 36.

2 ♂.—Fore wings of the same shape as in *E. sericeata*, but the hind wings are more rounded and not notched. Grayish-ochreous as a ground-color. Anterior half of the front palpi, and fore legs at base pink. Fore wings pink on the costa; a bright pink spot near the base of the wing on the inner edge; just beyond, a very oblique pink band; a parallel, slightly narrower, submarginal band; edge of the wing pink. Fringe dull ochreous. Three similar pink bands on the hind wings. Beneath, both wings uniformly dull pink.

Length of body, ♂, 0.25; of fore wings, ♂, 0.27–0.35; expanse of wings, 0.60–0.70 inch.

Dallas, Tex., Aug. 23, October 2 (Boll, Mus. Peab. Acad. Sc.).

EOIS Hübner. Plate 3, figs. 16, 17.

Eois Hübn., Verz., 308, 1–18.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 3, 1–27.

Fidonia Dup. (in part), Lep. France, vii (iv), 407, 1–29.

Hyria Steph., Nomencl. Br. Ins., 45, 1–29.

Acidalia H.-Sch. (in part), Schm. Eur., iii, 12, 1–17.

Hyria Steph., Cat. Br. Lep., 217, 1–59.

Acidalia Lederer (in part), Verh. Bot. Zool. Ges. Wien, 191, 1–53.

Hyria Guen., Phal., i, 428, 1–57.

Head small; front broad, subtriangular, narrowing considerably anteriorly. Palpi long, slender, upcurved, slightly projecting beyond the head. Male antennae very slender, simple. Fore wings much elongated; costa straight, except toward the apex, where it is arched; apex much produced,

subacute; outer edge very oblique. Venation: one narrow, linear, subcostal cell (in *ferruginata* open); the second and third subcostal venules much shorter than in *Acidalia*, parallel, and near the apex; the origin of the first and second median venules more remote than usual. Hind wings much rounded on the outer edge. The hind legs in the male rather smaller than the middle pair, and more or less aborted, when well developed; tibiae shorter than the femora, with no spurs; the tarsi longer than the tibiae.

The moths of this genus differ from *Acidalia* by their small size, the triangular, pointed fore wings, the well-rounded hind wings, and the broader front of the head. They are usually reddish-ochreous, with two darker common lines. *E. gemmata* is, however, ochreous-white, with a broad, conspicuous, dark-brown band common to both wings.

Larva.—"Caterpillars elongated, carinated, flattened on the back and a little less so beneath; head deeply notched on the vertex, with short hairs, the prothoracic ring with two pyramidal tubercles, and a third smaller one between them; living on low plants. Chrysalides subterranean."—Guenée.

Synopsis of the Species.

Whitish, with a brown, common, broad, central band.....	<i>E. gemmata</i> .
Like <i>gemma</i> , but large, and with a heavy submarginal line	<i>E. occidentata</i> .
Reddish, with brownish lines	<i>E. ferruginata</i> .

EOIS GEMMATA, sp. nov. Plate 10, fig. 37.

2 ♂.—Whitish-ochreous, of the tint of *Acidalia enucleata*. Head in front and beneath and palpi brown. On both wings, a broad common band, occupying the middle third of the wing; the band curves outward from the costa, is toothed on the lower subcostal venule, and again extends outward on the first and second median venules, while below is a broad, deep sinus; on the inner edge, the band is deeply sinuated from the costal edge to the middle of the submedian space; the edge of the band is of a rich brown, and in the middle are patches of a dull purple-brown. Both edges of the band on the hind wings are denticulated, there being three obtuse teeth on the inside, and two acute teeth on the outside; just beyond this band is a faint, diffuse, dusky line, and a submarginal one common to both wings; beneath, slightly paler than above, with the common dark band, and the shade next to it faintly reproduced.

Length of body, ♂, 0.22; of fore wing, ♂, 0.30; expanse of wings, 0.60 inch.

Waco, Tex., May 12-22 (Bellinger, Mus. Peab. Acad. Sc.); Clear Creek Canon, August (P. R. Uhler, Hayden's Survey).

This beautiful, delicate, little species differs from the other eastern species in its whitish color and the broad, sinuate, mesial, brown band. It closely resembles the Californian *E. occidentata* and may be found to intergrade with it.

Eois occidentata Packard. Plate 10, fig. 38.

Hypis occidentata Pack., Proc. Ent. Soc. Nat. Hist., xvi, 29, 1874.

1 ♂.—Fore wings with much the same shape as in *E. auroraria* of Europe, though the apex is slightly more rounded, while the hind wings have the outer edge more retund. Antennae finely ciliated. Body and wings very pale fawn-brown, tinged very faintly with vinous; vertex of head pale; front and palpi dark brown. Fore wings clear pale fawn, with the middle occupied with a broad dark hour-glass-shaped band, wider on the front edge than on the inner; the inner side quite regularly hollowed out, the outer side produced outward in the middle, with two acute parallel teeth, and a third below situated farther within the wing; below this, the band dilates on the inner edge, while on the costal side it goes nearly straight to the costa; a diffuse, faint, submarginal shade. On both wings, a row of venular, marginal, black dots; fringe long, silky, concolorous with the wing. Hind wings with the same markings as on the fore wings, but with the submarginal shade rather more distinct; the broad band has two larger teeth on the outer edge, and the shade beyond has two zigzag angles parallel with it. Obscure yellowish discal dots on both wings (distinct under a lens). Legs pale, fore femora and tibiae dark. Beneath, smoky, the bands being replaced by diffuse smoky lines.

Length of body, 0.24; of fore wing, 0.33; expanse of wings, 0.66 inch. California (Edwards).

This fine species differs from the eastern species (*E. geminata*) to which it is structurally closely allied, in having rather darker wings, with the submarginal band much darker, while the form of the middle band is quite different.

Eois ferrugata, *sp. nov.* Plate 10, fig. 39.

4 ♂ and 4 ♀.—Body and wings bright brick-red; head in front deep reddish-brown. Fore wings with three dusky lines, the two inner parallel,

slightly sinuous, the space usually filled up with dusky-brown, forming a broad band with its outer edge embracing the distinct discal dot. The outer line is wavy and curved outward regularly from the costa to just below the third median venule, where it is bent outward on to the inner edge. Beyond this line, the wing is usually clear, but in some specimens is dusky-brown except on the apex. A dark marginal line; fringe on both wings concolorous with the rest of the wing. Two wavy lines on the hind wings, the inner situated just within the distinct discal dot; the outer line is curved, sinuous, the curve outward being greatest behind the middle of the wing, and near the inner edge is a deep sinus; beyond this line, the edge of the wing is usually clear, but sometimes dusky reddish-brown. Beneath, much as above, with a common extradiscal wavy line, situated half-way between the discal dots and the edge of the wing; the hind wings have an ochreous tinge, concolorous with the under side of the abdomen.

Length of body, ♂, 0.30, ♀, 0.20–0.25; of fore wing, ♂, 0.35, ♀, 0.30; expanse of wings, 0.60–0.75 inch.

Amherst, Mass. (Professor Peabody); Demopolis, Ala. (Grote); Waco, Texas, May 27 to June 5, August 20, September 30 (Belfrage, Mus. Peab. Acad. Sc.).

This pretty species looks like a *Pyrausta* at first sight. It is closely allied to the European *E. auroraria*. I did not see it in the British Museum or in M. Guenée's collection. It may be known by the pale brick-red tint and the dusky reddish-brown shade situated within the middle of the wing.

CERATODALIA,* *gen. nov.* Plate 4, fig. 1.

Head with the front not very broad, subscutellate in shape; the sides parallel; eyes large, spherical. Palpi remarkably long, passing by one-half their length beyond the head; second joint very long, growing a little wider toward the end; third joint slender, pointed, not so long as the second joint is wide. Antennae of male simple, flattened, ciliated. Fore wings subfalcate, costa much arched, apex produced, but not acute, a little rounded; outer edge oblique, but straight in its course, much less convex than usual. Hind wings square, the angle of the outer edge very marked, the edge somewhat scalloped. The venation is much as in *Acidalia*, but there are two subcostal cells; the second subcostal vein arises half-way between the first and third,

* *Cerato*, feeder (alluding to the palpus), and *dalia*, mythological name.

while in *Acidalia* the origin of the second subcostal is usually very remote from the first subcostal; the median venules are shorter than in *Acidalia*. Legs very long and slender; hinder pair slender, the tibiae not swollen, but long and slender, with two pairs of large, long spines; tarsi two-thirds as long as the tibiae. Male abdomen very long and slender. Coloration: wings thin, glossy gray, with pale-yellowish costal spots, with two much-curved, sinuate, faint lines.

This genus is remarkable for the extremely long palpi, while the fore wings are much arched on the costa, and the angle of the hind wings is large and prominent. The venation differs chiefly from *Acidalia* in there being two subcostal cells.

CERATODALIA GUENEATA, *sp. nov.* Plate 10, fig. 10.

♂.—Body and wings ash-gray, with a silky luster. Head brown in front; orbits much paler. Fore wings with eight or nine pale-ochreous, irregular, costal spots, with about six indistinct lines, which are parallel and bent outward below the costal region nearly at right angles; the four inner lines are dark and indistinct; the fifth line is a continuation of one of the yellow costal spots; just below the costa, it is curved inward, and then makes a rectangular bend outward, and thence goes obliquely to the outer third of the inner edge, curving in a little on or just below the third median vein; a submarginal scalloped light line; a fine blackish marginal line on both wings; fringe pale gray, spotted with blackish. Hind wings with two much-curved pale shades, the outer bent at right angles and parallel with the outer edge of the wing. Beneath, highly colored; basal two-thirds of wing dark brown, mottled with light dots near the costa; a dark discal linear dot; half-way between the dot and the outer edge of the dark-brown area a dusky line, bent at right angles opposite the dot. The brown area is limited by a reproduction, very distinct, of the whitish line, which makes an acute rectangular bend opposite the discal dot, the angle being situated half-way between the discal dot and the apex of the wing. Beyond this line, the wing is much lighter, mottled with white, with deep-ochreous slashes, the veins deep ochreous, and the fringe as above. Hind wings with the same markings as above. Legs brown, ringed and spotted with whitish.

Length of body, ♂, 0.45; of fore wing, ♀, 0.55; expanse of wings, 1.05 inches.

Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zoöl.); California (Edwards).

The long palpi, the square, angled hind wings, the silken brown-gray wings, and the peculiar markings on the under side, the colors reminding one of the under side of a *Glaucopteryx*, and the very slender abdomen, characterize this peculiar species, which is named in honor of M. Guenée.

ASTHENA Hübner. Plate 4, fig. 2.

- Asthenia* Hübn., Verz., 310, 1818.
Acidalia Treits. (in part), Schm. Eur., vi (i), 3, 1827.
 Dup., Lep. France, vii (iv), 224, 1829.
 "Cymatida Sodoff., Bull. S. I. Mosc., 18, 1837."
Acidalia Boisd. (in part), Gen. Ind., 227, 1840.
 H.-Sch. (in part), Schm. Eur., iii, 12, 1847.
 Steph., Cat. Lep., 221, 1850.
Cidaria Lederer (in part), Verh. Bot. Zool. Ges. Wien, 253, 1853.
Asthenia Guen., Phal., i, 434, 1857.
 Walk., List Lep. Het. Br. Mus., xxii, 673, 1861.

Head narrow in front; sides of front parallel; eyes large, globose. Palpi very slender, not reaching the front. Male antennæ simple, as in *Acidalia*. Wings much as in *Acidalia*, but shorter, not subfalcate; apex much rounded; costal region rather wide. Hind wings much rounded, sometimes with a very slight angle. Venation much as in *Acidalia*; a single subcostal cell; the differences from *Acidalia* are mainly due to the differences in the shape of the wings. Hind legs well developed; tibiae long and slender, the spurs unusually long; tarsi not much more than half as long as the tibiae. Abdomen of male very long and slender. Coloration: white or ochreous, with four to six transverse, sinuous, darker lines.

This genus differs very slightly from *Acidalia*, and mainly in the more arched costa of the fore wings, the broad costal region, and the rounded apex. On these accounts, I originally mistook our *albogilvaria* for a *Corycia*.

Larva.—"Caterpillars short, moniliform, swollen in the middle, very attenuated on the anterior segments; flattened beneath and carinated on the sides during locomotion; head very small and globular; living exposed on trees. Chrysalides contained in leaves or in moss."—Guenée.

Synopsis of the Species.

White, bands yellow	<i>A. albogilvaria</i> .
White, bands brown, apex tipped with brown	<i>A. brunneifasciata</i> .
White, front of head brown, base and middle of wings brown and ochreous.....	<i>A. lucida</i> .

ASTHENA ALBOGILVARIA Packard. Plate 10, fig. 11.

Aidalia albogilvaria Morrison??, Proc. Bost. Soc. Nat. Hist., xvi, 124, 1871.
Corycia triseriata Pack., Sixth Rep. Peab. Acad. Sc., 50, 1871.

4 ♂ and 4 ♀. — Pure white. Front of head with a few ochreous scales. Antennae white, faintly ringed with dark. Eyes black. Fore wings slightly dusky beneath on base of costa, with three rather broad ochreous lines; the inner a little wavy, regularly curved, the two outer wavy, the middle with three scallops pointing outward and the line about twice as wide as the outer; the lines are sometimes equidistant; sometimes the two outer are nearer together. Hind wings with two wavy lines, the inner very near the discal dot; fringe white, discal dots black. Beneath, pure white, with the two outer lines indicated on the costa. Hind wings pure white.

Length of body, ♂, 0.30, ♀, 0.25; of fore wing, ♂, 0.36, ♀, 0.40; expanse of wings, 0.80 inch.

White Mountains, N. H.; Beverly, Mass., feeds on the elm (Burgess); Andover, Mass., July (Sanborn, Mus. Bost. Soc. Nat. Hist.); Amherst, Mass. (Goodell); Mount Tom, Mass., July 2 (Morrison); Albany, N. Y. (Lintner); Brooklyn, N. Y. (Graef); West Farms, N. Y. (Angus).

This pretty species may be at once recognized by the three sinuous, broad, ochreous lines on the fore wings, and two similar ones on the hind wings.

ASTHENA BRUNNEIFASCIATA, *sp. nov.* Plate 10, fig. 42.

4 ♀. — This species closely resembles the eastern *A. albogilvaria*, but is rather larger, though the shape of the wings is the same. Body and wings snow-white. Antennae spotted with blackish above; a pale-brown transverse line in front of the antennae. Fore wings with three irregular, more or less interrupted, sinuous, pale-brown bands, arranged as in the preceding species. Apex brownish. Beneath white; the lines do not re-appear, but the costal region is brownish.

Length of body, ♀, 0.28; of fore wings, ♀, 0.15; expanse of wings, 0.90 inch.

Victoria, Vancouver Island, July (Crotch, Mus. Comp. Zool.)

ASTHENA LUCATA Guenée. Plate 10, fig. 43.

Asthenia lucata Guen., Phal., i, 437, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 673, 1861.

2 ♀.—Wings of the same shape as in the other species. Head in front and thorax ochreous-brown. Wings white; fore wings with the space between the basal line and the insertion of the wing brown, mixed with deep ochreous; a median very sinuate line just beyond but touching the discal dot, and still beyond a broad, irregular, large, brown patch, represented on the costa by three spots, and below the third median vein by two lines; the patch extends to the indistinct submarginal line; apex clear white. On the hind wings, the discal dot is distinct, and there are traces of two brown lines in the middle of the wing. Beneath, the discal dots on both wings are distinct; on the fore wings are three indistinct scalloped lines, more or less diffuse and blended; on the hind wings, traces of a single curved line just beyond the discal dot.

Length of body, ♀, 0.30; of fore wing, ♀, 0.43; expanse of wings, 0.90 inch.

"Canada" (Guenée): Brunswick, Me. (Packard, Mus. Peab. Acad. Sc.); Dorchester, Mass. (Sanborn); Amherst, Mass., June 27 (Goodell).

This description should be compared with that of M. Guenée; but I have little doubt that the examples before me represent a variety of his species, but with the lines on the fore wings confused and blended. My description should be regarded as provisional.

ACTIDALIA Treitschke. Plate 4, figs. 3, 3*a*, 3*b*, 3*c*; plate 6, fig 24.*Cosmorhoe* Hübn. (in part), Verz., 326, 1818.*Eois* Hübn. (in part), Verz., 308, 1818.*Leptomacris* Hübn. (in part), Verz., 310, 1818.*Arrhostia* Hübn., Verz., 311, 1818.*Idra* Treits. (in part), Schm. Eur., v (i), 416, 1825.*Acidalia* Treits. (in part), v (ii), 438, 1825; vi (ii), 5, 1828.*Ptychopoda* Steph., Nomencl. Br. Ins., 45, 1829.*Dositheia* Dup., Lep. France, vii (ix), 408, 1829; viii (v), 43, 1830.*Acidalia* Dup. (in part), Lep. France, vii (ix), 408, 1829; viii (v), 70, 1830.

Curtis, Brit. Ent., 384, 1834.

Boursd., Gen. Ind., 221, 1840.

H.-Sch. (in part), Schm. Eur., iii, 12, 1847.

Steph., Cat. Brit. Lep., 221, 1850.

Lederer, Verh. Bot. Zool. Ges. Wien, 191, 1853.

Guen., Phal., i, 444, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 680, 1861.

Head very short; front narrow, and sunken between the large globose

eyes. Antennae simple in both sexes (except in *A. insulsaria* and *A. subalbata*, where they are well pectinated on the basal half). Palpi short, slender, porrect; third joint short, not extending usually beyond the front. Fore wings with the costa slightly arched, sometimes very straight; apex sometimes slightly subfalcate, outer edge usually bent slightly on the first median venule. Hind wings squarish, bent, or rounded. Venation: usually a small, diamond-shaped subcostal cell (in *insulsaria* there is no cell); the first subcostal venule is sometimes very long, but differs much in length in the different species; in *insulsaria*, it is no longer than the second subcostal venule. Hind legs with the tibiae large and much swollen; in the male with no spurs, or slender and spurred, with all grades between; tarsi either one-fourth as long as the tibiae or as long. Coloration: head often black in front; body and wings white, whitish-ochreous, or brown and red, with from two to four lines on the fore wings.

Larva.—"Caterpillars moderately long, but still slender, a little carinated on the sides, stiff, with minute transverse folds, slightly swollen on the posterior rings; head a little smaller than the prothoracic ring and retractile; living principally on low plants and hiding by day. Chrysalides subterranean." —Gueneé.

This is a remarkably homogeneous group, and the species are nearly always recognizable from the slightly-angulated wings, the short small head, usually black in front, and the slender, short, feeble palpi, and by the invariably simple male antennae.

The genus may be divided into three well-marked sections, as indicated in the synopsis of the species. In *A. ossulata*, the venation differs from the other species by the presence of two subcostal cells, while the origin of the first and second median venules is very far apart.

The most aberrant group is that represented by *A. insulsaria*, in which the costa of the fore wings is remarkably straight, and there is no discal cell (plate 4, fig. 3a); while the first subcostal venule is very short, and its origin is situated beyond that of the fifth subcostal. These characters are certainly of subgeneric value; but in other characters, the three species in this section agree with the more normal forms. In the third and highest section (C), there is much variation in the venation and proportions of the joints of the leg, as well as in the degree of angulation of the wings; but there is a common *facies* to the section. In no large genus will there probably be found a

greater shifting and variation of structural characters than in this, and yet it is nearly always easy to recognize an *Acidalia*.

I retain Treitschke's name for the group, as Hübner's *Archostia* only contained five out of over one hundred European species, and his views of the genus were vague compared with Treitschke's. Probably fifty or sixty additional species are to be discovered on this continent. But it is to be hoped that isolated descriptions of them will not be published.

Synopsis of the Species.

ATLANTIC STATES.

A. Species small; fore wings elongated; hind wings rounded:

- a. Ash-gray; fore wings with four lines beyond the discal dot:
 - Fore wings with outer edge convex.....*A. ossulata*.
 - Fore wings with outer edge very straight; apex pointed.....*A. prirrorata*.
- b. White, with ochreous lines:
 - Small; wings narrow; much elongated.....*A. longipennata*.
 - Like *longipennata*, but wings broader.....*A. perralbata*.
 - Like *perralbata*, but larger; submarginal line often zigzag, and black or ochreous.....*A. punctofimbriata*.
- c. Fore wings large; hind wings rounded:
 - Larger than any of the preceding; silky-ochreous, with slightly darker lines.....*A. productata*.

B. Costa of fore wings very straight, paler than rest of wing; hind wings short; outer edge less convex than usual:

- Hind wings very short, less convex than usual, triangular; pale greenish, with numerous fine obscure lines.....*A. insularia*.
- Reddish tinged with vermilion; costa reddish, and connected with three reddish transverse lines.....*A. pennaria*.
- Like *pennaria*, but hind wings as in *insularia*; costa of fore wings conspicuously white.....*A. albocostata*.

C. Of large size; hind wings usually angled; hind tarsi short:

- Whitish; no well-marked lines; fore and hind wings much rounded.....*A. rotundopennata*.
- Perfectly white; very large; hind wings much bent.....*A. airosata*.
- Hind wings slightly bent, fawn-gray, with four distinct, slightly darker lines.. *A. inductata*.
- Like *inductata*, but brick-red, and more hairy, with dark reddish-brown lines...*A. scatinata*.
- Whitish-ochreous; hind wings distinctly bent; two ochreous lines common to both wings; smaller than *enachata*.....*A. quadrifasciata*.
- Small. Wings narrow; hind wings very angular.....*A. caeciniata*.
- Fore wings subfalcate; whitish-ochreous; hind wings much bent; both wings with heavy black lines and patches on the outer third.....*A. enachata*.
- Wings subfalcate, nearly white, with two very distinct ochreous lines, common to both wings.....*A. ordinata*.

PACIFIC STATES.

A. Diminutive; hind wings rounded:

- Like *ossulata*, granite-gray.....*A. grantata*.

B. Hind wings angulated:

- Small, reddish ochreous; wings dusky at base; a submarginal row of black points *1* *5. a. a.*
 Like *A. undulata*, grayish ochreous, with two common dark lines *1* *a.*
 Like the preceding, but reddish, with deep, conspicuous, red, wavy line *1* *a.*
 Like *5. undulata*, but wings blunter, and outer edge of hind wings rounded; two outer lines on fore wings, much nearer together than usual; white *1* *a.*
 Wings subdulate, white, with five dusky lines on the fore wings; four common to both wings *1* *1. 5. undulata.*

ACHALIA OSSULARIA Guenée. Plate 10, fig. 44.

Leptomeres ossularia Hübner Geyer, Samml. Exot. Lep. Zutr., 27, figs. 909, 910, 1837.

Achalia ossularia Guenée, Plal., i, 155, 1857.

Walker, Lep. Hel. Br. Mus., xxx, 749, 1861.

12 ♂ and 20 ♀.—Of small size, with heavily ciliated male antennae; the fore wings long and narrow, outer edge long, oblique, quite full; hind wings produced considerably toward the well-rounded apex. Body and wings uniformly ash-gray. Fore wings with three blackish extradiscal lines common to both wings; a basal, dark, well-marked line, sometimes situated half-way between the base of the wing and the first extradiscal line, sometimes much nearer the latter; it is bent at right angles on the subcostal vein. The first extradiscal line is more or less sinuate, heavier, sometimes much broader than the other lines, and varying slightly in its distance from the distinct, round, black discal dot; the next line is linear, wavy, parallel to the first extradiscal line, and either a continuous line, or scalloped, or formed by a series of black dots; the next line is a submarginal shade, parallel with the outer edge of the wing, slightly diverging toward the costa from the second extradiscal line; fringe on both wings concolorous with the rest of the wing. Hind wings with the outer edge rounded, not bent; discal dot situated on the inner third of the wing, no lines within it. Beyond it are three lines, sinuous and parallel to each other, the outer one parallel with the outer edge of the wing; the lines are as on the fore wings; the innermost either runs just beyond the discal dot, or it nearly touches it and sometimes nearly includes it. Beneath, a little dusky, otherwise the same as above, with the three lines well marked, and hardly less clear than above, contiguous to each other and common to both wings (the second one often heavier than the others); marginal row of black dots as on the upper side. Hind legs either well developed, with the tarsi very long and equaling the tibiae in length, or sometimes partially aborted, short and small, not half as long as the middle pair; tarsi a little shorter,

sometimes not much more than half as long as the tibiae; the latter not swollen, and without spurs.

Length of body, ♂, 0.25–0.30, ♀, 0.27; of fore wing, ♂, 0.30–0.33, ♀, 0.35; expanse of wings, 0.60–0.70 inch.

Beverly, Mass., August 10 (Burgess); Natick, Mass., July 24 (Stratton); Springfield, Mass., July 19 (Dimmock); Amherst, Mass. (Professor Peabody); Philadelphia, Pa. (Amer. Ent. Soc.); Demopolis, Ala. (Grote); New Orleans, La. (Sallé, Mus. Peab. Acad. Sc.); Waco, Texas, May 28, June 27, July, August, September 14, October 24 (Belfrage, Mus. Peab. Acad. Sc.); Dallas, Texas, April 2 (Boll); "Pennsylvania" (Hübner and Guenée).

This common and widely-diffused species may be recognized by its diminutive size, the ash-gray long wings, the heavily-ciliated antennae, the cilia unusually stout and arranged in pairs, the three blackish extradiscal lines equally well marked on the upper and under side of both wings. It varies in size and the disposition of the lines.

ACIDALIA GRANITARIA Packard. Plate 10, fig. 45.

Acidalia grantaria Pack., Proc. Bost. Soc. Nat. Hist., xiii, 390, 1871.

3 ♂.—A smaller species than usual, of a granite-gray, slightly tinged with brown. Body dusky, with conspicuous white scales; tarsi white; abdomen ringed with white; tipped with white. Antennae with curved bristles. Palpi dark. Head rather dark. Inner half of fore wings uniformly black-pepper-colored, inclosing a black, round, rather prominent discal dot, just beyond which is an oblique, slightly waved, pale, whitish band, bordered externally with a black line, most prominent on the inner edge of the wing. Beyond this line is a narrow white line, broadest on the inner edge of the wing. Beyond is a brownish, broad, diffuse band, with a row of longitudinal white spots just beyond, with brownish scales between the spots. On the edge, at the base of the fringe, is a row of white spots, each spot with a dark patch on the outer edge, consisting of a few blackish scales. Fringe concolorous with the rest of the wing. Hind wings marked the same as in the fore wings and colored the same; just beyond the conspicuous discal dot is a brown line; beyond is a broader pale band, lined with black and with a narrow whitish line beyond; then succeeds a diffuse brownish band, and the outer edge and fringe are marked in the same way. The same markings are repeated on the under side of the wing; the discal dot is less distinct than above; beyond is a dis-

tinct, sinuate, blackish line on a whitish field, and still beyond is a brown line half as wide as on the upper side of the wing; the edge of the wing is whitish, with fine intervicular black spots, and the fringe is checkered with black opposite the ends of the venules.

Length of body, 0.23; of fore wing, 0.28; expanse of wings, 0.60 inch. California (Edwards).

Differs from the other species here noticed by its diminutive size and granite-gray color. It is closely allied in form and size, as well as the style of markings, to the eastern *A. ossulata*.

ACIDALIA PERIRRORATA Packard. Plate 10, fig. 16.

Acidalia perirrorata Pack., Fifth Rep. Peab. Acad. Sc., 71, 1873.

♂.—Compared with *A. ossulata* Guen., with which this species structurally agrees, the wings are much produced, and the primaries still more acute. The front of the head is not colored differently from the body, and the palpi are stout, porrect, but not passing beyond the front; body and wings, including fringe and palpi, ash-gray, paler than in *A. ossulata*. Fore wings crossed by three dark, distinct lines (often obscure); they are oblique, wavy, but not sinuate, being straight in their oblique course; inner line remote from the base of wing; second line running just beyond the fine dark discal dot, nearly touching it, and much nearer the outer than inner line; outer line straight, parallel with the outer edge; fringe pale gray, speckled finely with dark, dark at base. Hind wings paler than primaries, discal dot more distinct, with three faint lines beyond the discal dot. Beneath, much as above; more densely dusted than above on both wings; posterior half of primaries, except on outer edge, clear whitish; discal dots more distinct than above; the two outer lines on the fore and three outer lines on the hind wings distinct.

Length of body, ♂, 0.25, ♀, 0.25; fore wing, ♂, 0.38, ♀, 0.36; expanse of wings, 0.77 inch.

Waco, Texas, June, July, August (Belfrage); Dallas, Texas, April 2-5 (Boll, Mus. Peab. Acad. Sc.).

This peculiar species has the front not dark as usual, but concolorous with the body; this, with the pointed fore wings, with their long, very oblique outer edge, which is much less convex than in *A. ossulata*, the dark fringe, straight lines, and densely-dusted wings, will separate it from any other species known to me.

ACIDALIA LONGIPENNATA Packard. Plate 10, fig. 47.

Acidalia longipennata Pack., Fifth Rep. Peab. Acad. Sc., 71, 1873.

1 ♂ and 4 ♀.—A species with unusually long wings, the apex of the primaries greatly produced, while the hind wings are well rounded. The male antennae are almost subpectinated, the bristles arising from acute tubercles; female antennae filiform. Body and wings snow-white; palpi white, very slender; front of head brown-black; four small distinct discal dots. Primaries with three nearly equidistant, sinuate, wavy, rather broad, ochreous lines; the inner one sinuate, remote from the base of the wing; the middle one runs very near the discal dot, and is less sinuate than either of the two others; outer line deeply curved twice; fringe pure white. Hind wings like primaries, but with two ochreous lines beyond the distinct discal dot. Beneath, both wings a little dusky, more or less thickly speckled with dark scales, with a conspicuous dark hair-line half-way between the discal dot and outer line on both wings. A row of dark marginal spots, as usual, on the upper and under side of each wing.

Length of body, ♂, 0.37, ♀, 0.25–0.30; fore wing, ♂, 0.33, ♀, 0.30–0.38; expanse of wings, 0.80 inch.

Texas, May 2–8, September 24 (Belfrage).

This pretty snow-white species may be readily recognized by the long, pointed primaries, the slender white palpi, subpectinated antennae, and three distinct, sinuate, ochreous bands on the fore wings. The fore wings are longer than in *A. ossulata*, while the hind wings are more rounded. It differs from *A. peralbata*, to which it is nearest allied, by the longer and narrower wings and its smaller size. The markings are very similar in the two species, but in *longipennata* the discal dot and extradiscal line of the hind wings are situated farther from the base of the wing than in *peralbata*, this line in *longipennata* being a little outside of the middle of the wing.

ACIDALIA PERALBATA Packard. Plate 10, fig. 48.

Acidalia peralbata Pack., Fifth Rep. Peab. Acad. Sc., 70, 1873.

1 ♂ and 5 ♀.—A small species with wings of the usual form, not being elongated. Head white above, including antennae; front black-brown; palpi white, with a few brownish scales. Body and wings pure white, the latter with a few dark fine specks and four distinct dark discal dots. Fore wings crossed by three wavy, sinuate, ochreous lines, the first and second a little

nearer together than the second and third, the second touching the discal spot; the outer (or third) line is much more wavy than the inner two; it reaches nearest to the outer edge of the wing on the second median venule. The marginal black points distinct. Hind wings like the primaries, with two lines, the outer more zigzag than on the primaries, the inner running just beyond the discal spot.

Beneath, the discal spots larger than above, the basal line not present, the two outer lines dark brown, the inner the fainter and touching the discal dot, the outer broad, conspicuous. The marginal row of black points present, while the wing is dusted quite thickly with brown scales. Hind wings with a line a little beyond the discal dot, the outer line distinct (sometimes the inner line is wanting on both wings beneath). Fore and middle femora and trochanters brown in front.

Length of body, ♂, — ♀, 0.35; fore wing, ♂, 0.35, ♀, 0.35–0.39; expanse of wings, 0.80 inch.

Texas, May and June (Belfrage).

This pretty species differs from any other white species known to me by the three yellow-ochreous lines and dark lines beneath, and the clear black discal dots, as well as its small size and broad wings and whitish palpi.

ACIDALIA PUNCTOFIMBRIATA Packard. Plate 10, fig. 19.

Acidalia puncto fimbriata Pack., Fifth Rep. Peab. Acad. Sc., 70, 1873.

1 ♂ and ♀ 3.—Closely allied in structure and shape of wings to *A. peralbata*, though a rather larger species. Body and wings whitish-ochreous, with fine dark specks. Vertex of head and antennæ a little whiter than body; front of head and palpi dark brown. Fore wings crossed by five dull obscure subochreous lines; the inner bent outward sharply just below the costa; second line broader than the others, nearly touching or passing a little beyond the discal dot; third line fine, sometimes black, but distinct, waved, sometimes sharply scalloped, and sinuous, situated half-way between the discal dot and outer edge. Two obscure, somewhat diffuse, submarginal lines. Edge of wings with an interrupted dark-brown line. A row of black points (about eight) in the fringe. Hind wings marked like fore pair, except that there are but four lines. Discal dots black, distinct on each wing. Beneath, the discal dots distinct, black; and one prominent black fine line on both wings half-way between the discal dots and outer edge.

Length of body, ♂, 0.30–0.35, ♀, 0.30; fore wings, ♂, 0.30–0.40, ♀, 0.40; expanse of wings, 0.82 inch.

Texas, September (Belfrage); Philadelphia, Pa. (Amer. Ent. Soc.).

This species is marked by the black points on the fringe of both wings, as well as by the five subochreous lines and blackish palpi.

In the Pennsylvanian example, the third line is black, more distinct, with the scallops ending in sharp points; but the markings on the hind wings are as in the Texan specimens. It is a little larger than any from Texas.

This species is near Walker's *Acidalia tacturata* (plate 10, fig. 71), but the extradiscal line is situated much farther beyond the discal dot in the latter, and the line beyond is less sinuate and situated nearer the edge of the wing.

ACIDALIA PRODUCTATA, *sp. nov.* Plate 10, fig. 51.

2 ♂.—Head as usual; fore wings long and narrow, very much produced toward the apex; costa much arched toward the apex; outer edge very oblique; hind wings much rounded, slightly bent on the outer edge. Body and wings pale ochreous fawn-color. Head white between the antennae, black in front. Palpi short, not projecting as far as the front, deep ochreous. Occiput and front edge of the thorax a little deeper in tint than the rest of the body. Fore wings with three oblique firm lines, slightly darker than the rest of the wing; the middle and outer lines are much nearer together than the middle and inner; the middle line runs a little beyond the slight discal dot. On the hind wings, two faint darker lines, the inner one running close to the sublinear indistinct discal dot. Beneath, the discal dots are as distinct as above, and there is a line on the outer third of the wing more distinct than above, and common to both wings. Hind legs long and slender; tibiae long and slightly swollen; tarsi half as long as the tibiae.

Length of body, ♂, 0.35; of fore wing, ♂, 0.50; expanse of wings, 1.05 inches.

Philadelphia, Pa. (Amer. Ent. Soc.).

This delicate species has remarkably long fore wings, with the outer edge very oblique, and three faint fawn-colored lines; indistinct linear discal dots, and the hind tarsi are half as long as the tibiae. There is no species to which it is nearly allied. It is related in some respects to *A. enucleata*, though widely differing in the shape of the wings.

ACIDALIA INSULSARIA Guenée. Plate 10, fig. 52; plate 13, fig. 32, pupa.

Acidalia insulsaria Guenée!!!, Phal., i, 469, 1857.

Walk., Lep. Hel. Br. Mus., xxii, 718, 1861.

Acidalia persimilata Grote!!!, Proc. Ent. Soc. Phila., i, 347, pl. 3, fig. 5, 1863.

♂ and ♀.—A delicate species, with very triangular wings, especially the hind wings, which are less curved on the outer edge than usual, being nearly straight (but slightly bent), and as long as the inner edge; outer edge scalloped with fine points. Antennae and space between silvery-white; in the male, pectinated on the basal half; front of a peculiar greenish tawny hue; palpi pale, upcurved, and passing beyond the front, slender. Both wings alike, with a peculiar luteous tinge, and a very dull, slightly greenish, tinge, without any distinct lines, but flecked irregularly with darker scales, with a submarginal waved, white, obscure line, dotted with black on the venules. Discal dot represented by raised scales. Edge of both wings dark, slightly scalloped; fringe very long, slender, a little unequal; on the edge, a slight row of dark points. Beneath paler, with the submarginal row of minute black points present.

Length of body, ♂, 0.30, ♀, 0.28; of fore wing, ♂, 0.42, ♀, 0.38; expanse of wings, 0.75–0.85 inch.

Maine (Packard, Mus. Peab. Acad. Sc.): Chelsea, Mass., September (Sanborn); Andover, Mass. (Sanborn); Salem, Mass., July 18, at light (Casino); West Farms, N. Y. (Angus); Buffalo, N. Y. (Grote); Albany, N. Y., August 20, September 4 (Lintner and Meske); New Jersey (Sachs); Waco, Texas, October 24–28, November 13 (Belfrage); Dallas, Texas, May 4–12 (Boll, Mus. Peab. Acad. Sc.).

This very delicate luteous species, with an almost imperceptible greenish tinge, is, on both wings, flecked irregularly with darker scales, with no lines, except a submarginal, waved, fine, white line, with black points, on the venules. It may also be recognized by the short hind wings, with the outer edge much less convex than usual. Its range is wide, as it was one season common in Maine, and appears to be frequently taken in Texas. This common species is M. Guenée's *insulsaria*, as I learned by examination of his type-specimens; it is also Mr. Grote's *persimilata*, as I have received, through his kindness, several type-specimens. The larva I have reared on *Clastus scandens* at Brunswick, Me., but, unfortunately, preserved no description of the caterpillar. Mr. Belfrage has also reared it in Texas, and sent me the pupae.

Pupa (plate 13, fig. 32).—Flattened; the thorax above is produced into two ear-like projections at the insertion of the wings, somewhat as in *Ephyra pendulinaria*, the anterior end of the body being broad and truncate. The general color is horn-colored, with lighter streaks, and two dorsal rows of black dots. Length, 0.38 inch.

ACIDALIA PANNARIA Guenée Plate 10, fig. 53.

Acidalia pannaria Guen., Phal., i, 470, 1857.

Walk., Lep. Het. Br. Mus., xxii, 718, 1861.

Acidalia purpurissata Grote !!!, Can. Ent., iii, 103, 1871.

3 ♀.—Like *A. insularia*, the fore wings being triangular, the costa very straight, and the hind wings short, but the outer edge of both wings is fuller, and the moth is larger and stouter. Body and wings reddish-brown. Head deep reddish, concolorous with the fore legs. Front, thorax, and costa of fore wings with three well-marked, clay-yellow, much waved, nearly parallel lines, concolorous with the yellowish costa; the inner line is bent outward a little on the median vein and widens on the inner edge; the middle line is nearer to the outer than the basal, and both middle and outer lines are much waved, curving out below the costa and again on the second median venule; the two outer lines are edged irregularly with reddish; half-way between the inner and middle line is a long clay-yellow discal streak; a marginal row of clay-yellowish distinct dots. Fringe reddish. Hind wings with three well-marked, clay-yellow, wavy lines, as on the fore wings, with a marginal row of dots and reddish fringe. Beneath, yellowish flesh-colored, tinged with reddish, especially on the outer edge of both wings; costa yellowish; no lines or discal dots.

Length of body, ♀, 0.32; of fore wing, ♀, 0.40; expanse of wings, 0.80 inch.

Demopolis, Ala., July (Grote).

This well-marked species may be recognized by the resemblance in form to the common *A. insularia*, by the reddish color, and the three common wavy yellowish lines proceeding from the yellowish costa, and the marginal yellowish dots. I am indebted to Mr. Grote for type-specimens. It agrees exactly with M. Guenée's description.

ACIDALIA ALBOCOSTALIATA, *sp. nov.* Plate 10, fig. 54.

1 ♀.—Very near *A. pannaria* in the shape of the wings, but the costa is a little straighter, the apex very acute, indistinctly subfalcate, and there is a

slight bend in the outer edge. The hind wings are much as in *A. ussuriata*, the outer edge being very straight. The palpi are long and slender, curved up, and surpassing the front a little, being longer than usual. Body and wings clear reddish-brown, of a duller hue than *A. pumilio*. Even edge of thorax and costa of fore wings cream-white, forming a broad and conspicuous band. Fore wings with two slender, clear, white hair-lines; the inner curved and remote from the outer, which is sinuous, being curved outward on the median vein; a submarginal row of black faint scallops; a marginal row of black points. Fringe concolorous with the wings. Hind wings marked like the anterior pair, with a single clear, distinct, white line beyond the middle; four equal, dusky, diffuse discal dots; beneath, flesh-colored clay-yellow, mixed with reddish-brown; the discal dots distinct. No lines on the fore wings; a faint dusky shade beyond the middle of the wing, while the black marginal dots are reproduced.

Length of body, ♀, 0.32; of fore wing, ♀, 0.40; expanse of wings, 0.70 inch.

Demopolis, Ala. (Grote).

This remarkable species differs from any other of the genus by its brick-red body and wings, contrasting with the thoracic and costal broad conspicuous white band, and by the two fine distinct lines on the fore wings, as well as the submarginal row of dusky triangles and the marginal row of black dots.

ACIDALIA ROTUNDOPENNATA, *sp. nov.* Plate 10, fig. 55.

2 ♂.—Fore wings rather short, much rounded on the apex; outer edge moderately convex. Hind wings much rounded, not bent on the outer edge, which is very convex; the inner edge regularly rounded, not square, as usual. Body and wings cream-white, very finely dusted with brown, the speckles finer than usual. Head black in front; palpi very short and small, not reaching nearly as far as the front of the head, pale, concolorous with the rest of the body. Fore wings with only two parallel, very fine, indistinct, blackish, sharply-waved hair-lines, common to both wings, the outer of the two lines situated on the outer fourth of the wing. No discal dots on either pair of wings. Fringe on both wings cream-white, concolorous with the wings; a pale ochreous slightly-scalloped line at the base of the fringe. Wings semihyaline; fore wings a little dusky beneath, with diffuse linear

discal dots on both pairs of wings, with a single dark wavy line half-way between the discal spot and outer-edge of the wing, common to both wings. Hind tibiae long, not dilated; tarsi longer than the tibiae.

Length of body, ♂, 0.40; of fore wing, ♂, 0.50; expanse of wings, 1.00 inch.

Brunswick, Me., July 10, not common (Packard, Mus. Peab. Acad. Sc.).

This is an interesting species, with very small palpi, semitransparent wings, much rounded at the apex and on outer edge of hind wings, with two very faint, much waved, dark lines, the outer very distinct on the under side, and with the hind tarsi longer than the tibiae.

ACIDALIA NIVOSATA Guenée. Plate 10, fig. 56.

Acidalia nivosa Guen., Phal., i, 499, 1857.

Walk., Lep. Het. Br. Mus., xvii, 723, 1861.

5 ♂ and 2 ♀.—Of large size; costa of fore wings much arched, especially near the base; apex subacute; outer edge full but not bent; hind wings square, with a prominent angle in the middle. Body and wings uniformly snow-white, with no markings or discolorations. The front of the head is rather narrow and white, the upper edge of the short, slender palpi is discolored with blackish, but the terminal joint is white. Fore wings slightly discolored along the costa; four discal dots visible on the under side, not seen above; some specimens are entirely white. Fore tibiae dusky on the inside; hind tibiae considerably swollen, with two pairs of unequal spurs; the tarsi two-thirds as long as the tibiae.

Length of body, ♂ 0.50, ♀, 0.50; of fore wing, ♂, 0.60, ♀, 0.63; expanse of wings, 1.20–1.30 inches.

London, Canada (Saunders); Essex County, Vt., July 28 (Cassino); Maine, August (Packard); vicinity of Boston, Mass. (Sanborn); Easton, Pa. (Stultz).

This species, while closely resembling *A. enucleata* in size and the shape of the wings, differs in the narrower front of the head, the more arched base of the costa of the fore wings, and the presence of tibial spurs; it is much slighter. Well-preserved examples show the four dark discal dots and dusky tint on the under side of the anterior tibiae and along the palpi. Other examples are immaculate, and justify Guenée's remark that this is the only example known to him of a Lepidopter "entirely white in all its parts".

ACIDALIA RUBROMARGINATA Packard. Plate 10, fig. 57.

Acidalia rubromarginaria Pack., Proc. Ent. Soc. Nat. Hist., xiii, 391, 1871.

6 ♂ and 2 ♀.—Brown, with a reddish tint. Body and base of both wings ferruginous dull brown; both wings dusky reddish brown at base; on fore wings, this tint extends to a little beyond the middle of the wing, its outer edge irregular, angulated in the middle and excavated below. In some specimens, it is crossed just before the middle of the wing by a slightly oblique, dark line, on which rests an irregular row of light brown scales; in other specimens, the inner half of the wing is entirely dusky-brown; beyond, the wing is of a clear tawny brown, with a submarginal line curved and slightly waved, either entire or made up of black dots on the venules, connected by a slight line; this line is parallel with the outer edge of the basal dark area; a marginal row of black dots; fringe deep brick-red. Hind wings the same; the dark portion at base extends nearly to the middle of the wing, and the broken, wavy, curved line of dots is half-way between this and the outer edge; fringe brick-red, contrasting well with the clear tawny brown of outer two-thirds of wings. Beneath, uniformly pale tawny brown, with a common, diffuse, waved, middle line, doubled on the anterior half of hind wings, inclosing a narrow, oval, irregular spot, and a very faint submarginal row of minute black dots; fringe red.

Length of body, 0.28; fore wing, 0.35; expanse of wings, 0.80 inch.

Nahant, Mass. (Möring); Dallas, Texas, April 4 (Boll, Mus. Peab. Acad. Sc.); Central Missouri, May (Riley); Lawrence, Kans. (Snow); California (Edwards).

The Nahant example differs from the others in the dusky band of the fore wing being nearer the base of the wing, while the outer dark line is less sinuate below the costa, though agreeing quite well in the latter respect with one or two Californian examples. The specimen from Missouri does not differ from those Californian examples in which the base of the wings are clear, not dusky, nor does it differ in size. The Kansas and Texan examples differ from all the others in their different tint, being more decidedly wine-reddish. Both pairs of wings are clear at base; but in the fore wings is a median diffuse shade, which, however, does not extend on to the hind wings, which are clear, uniformly reddish, as in the fore wings, and with only a single black line, consisting of connected black dots; the line is less sinuous than usual, and situated farther from the edge of the wing than usual. The species may be

known by the squarish hind wings, its deep-red color, and the very sinuous outer line common to both wings, and by the basal two-thirds of both wings being often blackish.

ACIDALIA INDUCTATA Guenée. Plate 10, figs. 58, 59.

Acidalia inductata Guen.!!!, *Phal.*, i, 491, 1857.

Acidalia frigidaria Möschler, *Wiener Ent. Monats.*, 44, taf. 10, fig. 1, 1860.

Acidalia inductata Walk., *List Lep. Het. Br. Mus.*, xxii, 721, 1861 (not *inductata* p. 792).

Acidalia okakaria Pack., *Proc. Bost. Soc. Nat. Hist.*, xi, 43, 1867.

10 ♂ and 8 ♀.—Fore wings subacute at the tip; outer edge not bent; hind wings slightly bent on the outer edge, but decidedly less so than in *A. 4-lineata*. Head with the front black; vertex, body, and wings of a uniform light grayish-ochreous, being darker and more grayish than in *A. enucleata*. Palpi blackish above and at tip (sometimes entirely grayish). Both wings alike, and speckled with scattered fine black scales. Fore wings with three well-marked, parallel, darker lines, and a fourth fine, wavy, paler, submarginal line, all equidistant, the third sometimes darker than the two inner and decidedly wavy; a marginal row of black linear marks; a distinct discal fine black dot, just within the second (extradiscal) line; on the hind wings, the dot is just without the same line. Hind wings with three darker lines; fringe on both wings concolorous with the rest of the wing. Beneath, colored as above, perhaps a little more dusky, but the lines are darker, more wavy, the second common line much waved, the scallops acute, the marginal black points distinct. Hind tibiae swollen, dilated, fringed on the edge; tarsi slightly longer than the tibiae.

Length of body, ♂, 0.38. ♀, 0.30-0.38; fore wings, ♂, 0.45, ♀, 0.40-0.45; expanse of wings, 0.80-0.95 inch.

I am inclined to regard Möschler's *Acidalia frigidaria* (my *A. okakaria*, fig. 59) as a climatic variety of this species. About one specimen, from Hopendale, I have no doubt. The two other better preserved specimens are more densely dusted with dark scales, and the lines are consequently less distinct, and there are no discal dots to be seen on either side. It may be regarded as a melanotic variety of the common and wide-spread *A. inductata*.

Brunswick, Me., June 16 to July 30; Salem, Mass. (Packard, *Mus. Peab. Acad. Sc.*); White Mountains, N. H., late in August (Scudder, *Mus. Peab. Acad. Sc.*); Mount Washington, N. H., July 4 (Morrison); Brookline, Mass., August 20 (Shurtleff, *Mus. Bost. Soc. Nat. Hist.*); Natick, Mass., July 17

to 24 (Stratton, Mus. Bost. Soc. Nat. Hist.); Amherst, Mass. (Goodell); London, Canada (Saunders); Brooklyn, N. Y. (Graef); West Farms, N. Y. (Angus, Mus. Peab. Acad. Sc.); Brewster's, N. Y. (Grote); Oneida, N. Y. (Hawley); New Jersey (Sachs); Lawrence, Kans. (Professor Snow); Glen-coe, Nebr. (Dodge).

This common species is as abundant as *A. 4-lineata* in the Northeastern States, and may be recognized by the ochreous-gray body and wings, the blackish front, the hind tarsi being slightly longer than the tibiae, and by the presence of discal dots and marginal lines; the wings are much less angulated than in *A. 4-lineata*. There is no species in the Northeastern States with which it can be confounded. It is very closely related to *A. californiata*, but is much paler, less hairy, with distinct discal dots. The examples from Kansas and Nebraska do not differ from eastern ones, and show no approach to *californiata*.

I append my original description of *A. okakaria*:—Very uniform, finely mottled gray, with a pearly luster on both wings. Head with the vertex whitish; antennae finely ciliated, gray above, with blackish fine scales; front black, orbits with a few gray scales. Palpi black, with a few gray scales above. Wings with three dusty obscure stripes: the basal line oblique, not zigzag, obsolete on the costa and inner edge; a mesial oblique line; the outer parallel line once waved, and flexed outward in the middle of the wing. No discal dot or any other markings on either wing; edge with a very narrow dark line; fringe long, concolorous with the rest of the wing. Hind wings with two lines, the inner very obscure, the outer more distinct, curved, and sinuate slightly in the middle; edge of the wing and fringe just as in the fore wing. Beneath, very uniform gray, but little lighter than above; at the base of the wing, a pearly luster; darker on the costa and outer edge, with the lines as distinct as above, the outer more so, and flexed as above. No discal dot on the fore wing; that on the hind wings is nearly obsolete. Legs dark above, paler beneath.

Length of body, 0.38; of fore wing, 0.48 inch.

Okak (Weiz): Hopedale, August 3, frequent.

ACIDALIA CALIFORNIATA Packard. Plate 10, fig. 60.

Acidalia californiaria Pack., Proc. Bost. Soc. Nat. Hist., xiii, 329, 1874.

Acidalia pacificaria Pack., Proc. Bost. Soc. Nat. Hist., xiii, 329, 1874.

♂ and ♀.—Snuff-brown: head and antennae and thorax darker brown; antennae with long dense cilia, curved at the ends. Abdomen concolorous

with the thorax. Wings of a uniform snuff-brown, speckled minutely with black, especially along the costa. No basal line on fore wing; a prominent dusky, diffuse, wavy, extradiscal line, oblique, a little sinuate, parallel with the outer edge of the wing; half-way between this and the base of the fringe are two indistinct lines, the inner one more distinct and very wavy; a narrow dark line along the base of fringe, which last is clear snuff-brown. A marginal row of distinct, minute, black dots. A faint brown discal dot. The same lines are repeated on hind wings. Beneath, scarcely paler than above, with the extradiscal line black and very distinct, finer than on the upper side; the two other lines very faint, the inner one, however, in some specimens, quite distinct and very wavy. A marginal row of small black dots; the base of both wings is thickly speckled with black scales.

Length of body, 0.35; fore wing, 0.35–0.46; expanse of wings, 1.00–0.40 inch.

Mendocino City, Cal.; San Mateo, Cal. (A. Agassiz); Sanzálito, Cal., May 6 (Behrens); California (Edwards); mountains of Colorado, July 22 to August 29 (Lieutenant Carpenter); banks of Blue River, Middle Park, elevation from 9,000 to 10,000 feet (Mead); Colorado (Mr. Kidings).

Having received more specimens from Mr. Edwards, I find that *A. pacificaria* is simply a variety of *californiaria*, differing in its smaller size, the more rounded apex of the fore wings, and the less oblique outer border. The extradiscal line is blacker than usual and much less oblique, with a bend inward below the median vein. Discal dot distinct, black. Near the outer edge is a pale, clear, irregular, scalloped line parallel to the outer edge, and diminishing in width toward the costa. It is as common apparently in California as its representative, *A. inductata*, is in the States east of the Rocky Mountains.

ACIDALIA SENTINARIA Hübner and Geyer. Plate 10, fig. 61.

Hamatops sentinaria Hübner and Geyer, Zutr., 9, figs. 823, 824, 1837.

"*Aspilaua spuriaria* Christoph., Ent. Zeit. Steft., xix, 312, 1858."

Acidalia spuriaria Moesch., Wien. Ent. Monats., 12, taf. 10, figs. 6, 7, 1860.

1 ♂.—Antennae very strongly ciliated, two pairs of ciliae to each joint, much as in *A. rubrolineata*; body rather more hairy than in the Californian species. Dark reddish brick-brown; body and base of wings darker than the wings. Fore wings rather narrow, with four blackish lines, the basal farther from the insertion of the wing than usual, and united with the second line on

the median vein. Second line zigzag, situated in the middle of the wing. Half-way between it and the outer edge of the wing is the sinuous extradiscal line, accompanied externally by a faint dark line. There are three lines on the hind wings. Beneath, of a decided ochreous tint, with black scales at the base, and two very dark lines common to both wings. Fringe above concolorous with the wings, beneath with a reddish tinge. Legs bright shining gray.

Length of body, ♂, 0.35; of fore wings, 0.17; expanse of wings 1.05 inches.

Okak, Labrador (Mus. Peab. Acad. Sc.).

This interesting species differs from all the eastern forms by its heavily-ciliated antennae, its bright brick-red wings, which are pure ochreous beneath. It is closely allied to the Californian *A. rubrolineata*, but rather darker, with darker lines, and the body is rather more hairy than in the Californian species. It differs, in fact, from the Californian *rubrolineata* in those characters which Arctic species are apt to have, viz. a tendency to melanism, a more hairy body, and heavily-ciliated antennae.

ACIDALIA RUBROLINEATA Packard. Plate 10, fig. 62.

Acidalia rubrolinearia Pack., Proc. Bost. Soc. Nat. Hist., xvi, 28, 1874

1 ♂ and 1 ♀.—Closely allied to *A. californiata*. Dull reddish-ash; the fore wings with four dull brick-red wavy lines (three on hind wings). Body and appendages, including legs, a little darker than wings, especially on the under side of body, where there are black scales mixed with the brown ones. Palpi stout and bushy, with unusually long hairs. Antennae with long dense ciliae; beneath black, above pale brown. Wings a little darker at base than externally; fore wings with a basal curved, reddish-brown line; an indistinct brown discal dot; beyond, three parallel dull reddish-brown wavy lines, the inner twice as broad as the outer. An interrupted fine black line at the edge of the fringe on both wings. Hind wings with three lines, the inner straight, the broadest and darkest wavy, within which the wing is dusky. Fringe on both wings reddish snuff brown.

Beneath, the wings are a little clearer than above, with the two middle lines very distinct, reddish-brown, the inner less wavy than the outer, the wing within being dusky, edge of wing with the black line and fringe as above. Legs reddish-brown, tarsi paler, though with scattered black scale.

Length of body, ♂, 0.35, ♀, 0.33; fore wing, ♂, 0.43, ♀, 0.43; expanse of wings, 0.85 inch.

California (Edwards).

This species is deeper brick-red than usual, and the scales on the palpi are longer and more spreading than usual, with four brick-red lines crossing the fore wings; the middle line on hind wings is much more waved than in *A. californiata*. It is very closely allied to *A. sentinaria*.

ACIDALIA SUBALBARIA Packard. Plate 10, fig. 63.

Acidalia subalbaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 25, 1874.

1 ♂ and 1 ♀.—Allied in general form to *A. 5-lineata*, but with the apex of fore wings much blunter, with the hind wings much shorter, and with the outer edge rounded instead of angulated. Head and antennae white; front with a broad black band just below the insertion of antennae, which are well pectinated in the male. Cream-colored, being whitish, with a very faint ochreous tinge, whiter and less speckled, with darker scales than *A. 5-lineata*. Primaries crossed by three light-brown lines, the basal slightly curved, farther from the base of the wing than usual. The two outer lines much nearer together than usual, the inner one being narrower and less distinct; both are less oblique than usual, and not waved. Discal dot obsolete. Hind wings with a discal dot, and beyond the two parallel outer lines the same as on the hind wings. Both wings with a narrow black line at base of the whitish fringe. Beneath, cream-white; discal dots distinct on both wings, those on the primaries largest; beyond them, a common, diffuse, dusky line, straight on the fore wings. A fine, narrow, brown line at base of fringe. Legs white; fore femora and tibiae blackish in front.

Length of body, 0.30; fore wing, 0.47; expanse of wings, 1.00 inch.

California (Edwards).

In this species, the wings are clearer whitish than common, especially on the under side, and the two outer lines are nearer together than usual, while the hind wings are shorter, and with the outer edge less convex than usual in those species in which the hind wings are rounded instead of angulated. The male antennae are well pectinated, an unusual exception to their ordinary form in this genus.

ACIDALIA QUADRILINEATA, *sp. nov.* Plate 10, fig. 64.

8 ♂ and 6 ♀.—Fore wings less acute and hind wings less angled than in *A. enucleata*. Front black, extreme edge paler. Palpi rather large, heavier than usual, projecting well beyond the front, and blackish above. Antennae of male whitish above, beneath testaceous, with a minute fringe. Wings white, peppered over with black scales, with sometimes five (usually three) rather broad, pale-ochreous, oblique, firm lines, the marginal one curved and parallel with the edge of the wing; costal border ochreous; fringe long, ochreous at base. The same arrangement of four lines on the hind wings, the lines being very equal in size, three of them being a little broader and more diffuse than the basal one. Beneath, the wing is subochreous on the costal and outer edge, usually with a dark scalloped line common to both wings, and situated half-way between the discal dot and outer edge. Legs white, fore legs brownish. Hind tibiae flattened and swollen, but less so than in *A. enucleata*, while the tarsi are two-thirds as long as the tibiae.

Length of body, ♂, 0.38, ♀, 0.35; of fore wing, ♂, 0.50, ♀, 0.50; expanse of wings, 1.08 inches.

Orono, Me., July 4; Brunswick, Me., July 10; Salem, Mass. (Packard, Mus. Peab. Acad. Sc.); White Mountains, N. H.; Mount Washington, July 7 (Sanborn, Mus. Bost. Soc. Nat. Hist.); White Mountains, N. H., July 20–30 (Scudder); Mount Washington, N. H., July (Morrison).

Brookline, Mass., June 4; Cambridge (Shurtleff, Mus. Bost. Soc. Nat. Hist.); Central Missouri, April (Riley); Michigan (Miles).

This moth, where it occurs, is fully as common as *A. enucleata*, but seems more restricted to the Northern States. It differs from *A. enucleata*, to which it is nearest allied, by its smaller size, the much longer hind tarsi and shorter tibiae, the less pointed and angulated wings, by the want of any discal dot and marginal black dots, while the extradiscal line is firm, not waved. It varies much in the number of the lines, there being often only three lines on the fore wings and three on the hind wings, and sometimes the lines are nearly effaced. It differs from Walker's description of *A. restrictata* in wanting any discal dots or submarginal lines, and in its smaller size. On a comparison with Mr. Walker's type of *A. restrictata*, kindly made for me by Mr. Charles O. Waterhouse, assistant in the British Museum, it proves to be different. Mr. Waterhouse writes me that it differs from the specimens [of *A. quadrilineata*] sent, in having the apical of the three transverse bands

of the fore wings distinctly flexuous, the basal band being scarcely visible. The hind wings with the basal and second band wider apart, and with a commencement of a band between the second and third band. There are three minute black dots at the apex of the fore wings. It is very closely allied but distinct."

ACIDALIA CACUMINATA MORRISON. Plate 10, fig. 50.

Acidalia cacuminaria Morr., Proc. Bost. Soc. Nat. Hist., xvi, 191, 1874.

3 ♀.—Fore wings much elongated, with the costa rather straight, slightly convex toward the apex, which is subrectangular; outer edge slightly bent, oblique. Hind wings remarkably square, the outer edge long, with a very prominent angle, the inner angle sharply rectangular, and the inner edge is short, much shorter comparatively than in *A. enucleata*, for example. Palpi black, rather long and slender, passing slightly beyond the front; third joint small, but slender and pointed. Head black in front; vertex concolorous with the rest of the body and wings, which are whitish ochraceous, being of the same tint as in *A. enucleata*. Fore wings with the basal line obsolete, represented by a few dark venular scales; discal dot round, black, distinct; a dull-reddish, extradiscal, very oblique, sinuous line, not running very near the discal dot; half-way between the discal dot and the outer line is a series of large black spots, becoming large and confluent on the inner edge of the wing; just beyond, a similar line, fading out toward the costa, and more or less confluent with the other line toward the inner angle; a marginal row of large and conspicuous black dots. Hind wings with four lines, the innermost reddish, running directly from the inner edge to the distinct discal dot; beyond is a parallel, straight, reddish line, with black dots; the third line is like the second, but sinuous, and with heavier black dots, but with no reddish tinge; a curved, submarginal, black, narrow line; marginal black spots as on the fore wings; beneath, paler than above; discal dots large, alike on both wings; a single, diffuse, irregular, black, sinuous line, about half-way between the discal dot and outer edge, and common to both wings; submarginal dots distinct; a few dusky scales scattered over the wings; sometimes a submarginal shade, with a large dark cloud near the inner angle. Abdomen with a row of black dots.

Length of body, ♀, 0.30; of fore wings, ♀, 0.40; expanse of wings, 0.85 inch.

Brunswick, Me. (Packard, Mus. Peab. Acad. Sc.); "Mass., early in July" (Morrison); West Farms, N. Y. (Angus, Mus. Peab. Acad. Sc.); Philadelphia, Pa. (Amer. Ent. Soc.); Maryland (Mus. Comp. Zool.); New Jersey (Sachs).

This remarkable form may be recognized by the large and very distinct angle in the hind wings and the three black lines consisting of black dots on the outer fourth of the fore wings, which are continued on the hind wings, and by the row of black dots along the abdomen.

ACIDALIA ENUCLEATA Guenée. Plate 10, fig. 67. Larva, Plate 13, fig. 26; pupa, fig. 26*a*.

Acidalia enucleata Guen., Phal., i, 505, plate 12, fig. 3, 1857.

Walk., Lep. Het. Br. Mus., xxii, 723, 1861.

20 ♂ and 5 ♀.—Of large size. Fore wings pointed at the apex, distinctly angulated on the outer edge. Hind wings square, the angle more distinct than usual; outer edge slightly scalloped. Body and wings whitish-ochreous. Head whitish on the vertex, black-brown in front; palpi blackish above; tip blackish. Fore wings with three faint-ochreous lines, the inner oblique, faint, and parallel with the middle line, the latter bent at nearly right angles below the costa, the outer or extradiscal line bent at right angles below the costa, and below much waved. Below the subcostal bend, this line blends with a black patch, growing wider toward the inner angle of the wing. Beyond is a diffuse, wavy, black line; when the dark patch is wanting, there are two wavy submarginal lines. Hind wings with three lines, the inner one ochreous, nearly touching the discal dot, running inside of it, the distance between the two outer lines equal to the distance from the discal dot to the inner of the two lines, the two outer lines usually blackish instead of ochreous, and discolored as on the fore wings. A marginal row of black dots on both wings; fringe on both wings concolorous with the rest of the wings. Beneath, whitish; costa ochreous; discal dots on both pairs of wings; a single dark, wavy, extradiscal line on the fore wings; no lines on posterior pair; marginal dots distinct. Hind tibiae of male very broad, dilated, no spurs; tarsi but little longer than the tibiae are broad.

Length of body, ♂, 0.52, ♀, 0.50; of fore wing, ♂, 0.55, ♀, 0.60; expanse of wings, 1.15–1.20 inches.

Brunswick, Me., July 10, and later in the month (Packard, Mus. Peab.

Acad. Sc.); Calais, Me., July 19; Brookline, Mass., July 19–29; Carver, Mass., July 23 (Shurtleff, Mus. Bost. Soc. Nat. Hist.); Natick, Mass., July 22 to 29 (Stratton, Mus. Bost. Soc. Nat. Hist.); London, Canada (Saunders); Amherst, Mass. (Goodell); Essex County, Vt. (Cassino); Kennebunk, Me. (Rev. Mr. Swan, Mus. Bost. Soc. Nat. Hist.); Albany, N. Y., July 12, August 15 (Lintner); West Farms, N. Y. (Angus, Mus. Peab. Acad. Sci.); Brooklyn, N. Y. (Graef); Oneida, N. Y. (Hawley); Philadelphia, Pa. (Amer. Ent. Soc.); Easton, Pa. (Stultz); Waco, Texas, May 5–10, August, and September (Belfrage, Mus. Peab. Acad. Sci.); Dallas, Texas (Boll); Central Missouri (Riley); Lawrence, Kans. (Professor Snow).

This is our largest and most widely distributed species, ranging from the Saint Croix River, Maine, to Waco, Texas. It differs from any other in its large size, the acute fore wings, and the well-marked fine lines on the fore wings; the two submarginal ones, instead of being ochreous, are usually black and confused into a large conspicuous black patch near the inner angle, while on the hind wings there are often three well-marked, black, wavy lines; sometimes the lines are so heavy on the fore wings as to inclose dark round patches. It is a variable species, but always easily recognized. It is evidently double-brooded in Texas, the moths appearing in May and again in August; but in New England only in midsummer.

Larva.—"Caterpillar elongated, of a dark green, with the incisions and a dorsal annular spot on each wing of a deep red; the under side dark roseate, with a white stigmatal line on the posterior wings. It lives in the spring on *Rhexia lutea*, and enters the ground toward the beginning of April. The chrysalis is brown, and depressed on the back."—Guenée.

ACIDALIA QUINQUE-LINEARIA Packard. Plate 10, fig. 65.

Acidalia 5-linearia Pack., Proc. Bost. Soc. Nat. Hist. xiii, 389, 1871.

5 ♂ and 5 ♀.—White, speckled with minute brown scales. Head white on the vertex; front black; palpi white, edged above with black scales. Antennae of male with long coarse hairs. Thorax and abdomen white; wings white, finely powdered with brown scales. Fore wings with five yellowish-brown lines, the basal one on the inner fourth of the wing much curved on the median vein; the second is the broadest and most distinct, going obliquely from the outer third of the costa to the middle of the inner edge; half-way between this line and the outer edge is a wavy slender line, parallel to the

edge, and between it and the outer edge are two faint, diffuse, irregular lines. The outer four of these lines are continued on the hind wing, the inner and shortest one being straight and distinct, the others more or less waved; discal dot minute, black, much larger, and more distinct on hind wing. The outer edge of fore wing is narrowly edged with black between the venules, and there are small black dots on the fringe opposite the ends of the venules; fringe white; costa testaceous above and on the under side. Beneath, the discal dots more distinct; beyond the discal dots on fore wings are two black lines, the outer wavy, and on the hind wings one line only is present, being wavy and situated nearer the outer edge than its fellow on the upper side; wings paler than above; the innermost line on the fore wings is often obsolete.

Length of body, 0.38–0.48; fore wing, 0.54–0.64; expanse of wings, 1.10 inches.

California (Edwards; Behrens).

This species is apparently common in the Pacific States, representing and being closely allied to our eastern *A. enucleata* Guen.; it is also frequently met with in Colorado. It was discovered by Lieutenant Carpenter, near Denver, and near Kenosha House on the South Park road, four miles from the Park; elevation, 9,000 feet. It was found in Clear Creek Cañon by Mr. Uhler (Hayden's Survey) in August; also at Blackhawk, July 2, Golden, July 3, and Manitou, July 15 (Packard, Hayden's Survey). This species is closely related to *A. strigilaria* from Central and Southern Europe, Russia, and Amur.

ACIDALIA ORDINATA Walker. Plate 10, fig. 66.

Acidalia ordinata Walk., Lep. Het. Br. Mus., xxii, 722, 1861.

Acidalia candidaria Pack., Fifth Rep. Peab. Acad. Sc., 72, 1873.

Unusually glistening white, free from dark speckles. Body white. Head black in front; palpi rather short, tip obtusely pointed, black above and at tips, beneath whitish; antennae white, densely ciliated. Wings pure glistening-white, with three ochraceous lines, oblique, very slightly sinuate; inner one smallest, not reaching the costa; the middle one the widest; submarginal one more sinuate than the others, not reaching the apex. A narrow, marginal, ochraceous line at base of the white unspotted fringe. Two lines of equal width on hind wings, the inner one straight, bent a little just before the costa; the outer bent in the middle and a little inward. Beneath, entirely white; costa of fore wings tinged with pale ochraceous; lines very faintly reproduced

beneath; body and legs with a slight ochraceous tinge; hind tibiae greatly swollen, white above; hind tarsi very short, only one-third longer than the thickness of the tibiae.

Length of body, 0.50; length of wing, 0.60; expanse of wings, 1.25 inches.

Georgia (LeConte, Harris Coll.); "Georgia" (Walker).

It differs from any northern species known to us by its white body and wings being unusually free from dots, by the three parallel pale ochraceous lines not reaching the costa of the fore wings, by the greatly swollen hind tibiae, and by the black palpi, white beneath. The specimen in the Harris collection is considerably larger than Walker's, his example expanding one inch. I have been able to determine Walker's species from a drawing made under the direction of Mr. A. G. Butler from the type in the British Museum.

Desiderata.

Acidalia magnetaria Guen., Phal., i, 450.—"24^{mm}. Ailes entières, pulvé-
rulentes, couleur de rouille, avec un liséré terminal peu marqué, et les dessins
ferrugineux-foncés. Une ombre médiane commune passe derrière un point
cellulaire, et la base de l'aile est plus foncée, surtout aux inférieures. Puis
vient la condée, également commune, fine, tremblée ou denticulée, suivie
des deux ombres subterminales ordinaires. On voit, en dessous, les mêmes
dessins proportionnément plus marqués. Antennes à cils assez longs et frisés.
Tête concolore, très-velue. Tibias postérieurs très-épais, fusiformes, sans
éperons, avec le tarse de même longueur.

"Californie. Deux ♂ envoyés par M. Lorquin.

"Cette espèce est à la *Sideraria*, ce que la *Perochraria* est à l'*Ochrata*."

Acidalia sideraria Guen., Phal., i, 451.—"34^{mm}. Ailes arrondies, d'un
gris-argileux pulvérulent et teinté de rougeâtre, surtout à la côte, sur les bords
et sur la frange, avec deux lignes médianes communes très-parallèles, trem-
blées, noirâtres, et de fins traits terminaux noirs, presque contigus. Supé-
rieures ayant en outre une extra-basilaire arquée et les traces, à peine visibles,
d'une subterminale claire. Dessous plus rougeâtre, avec les mêmes dessins.
Antennes courtes, avec des cils longs, fasciculés. Tibias postérieurs renflés,
sans éperons, avec le tarse de même largeur. ♀ plus petite (29^{mm}), d'un
rouge plus clair et plus uni, avec un point cellulaire visible.

"Californie. Un ♂, une ♀. Coll. Gu.

"A.—Plus petite (27^{mm}). Les deux lignes plus rapprochées, moins parallèles, plus arquée; la cordée suivie de deux ombres subterminales, plus marquées en dessous.

"Californie. Un ♂. Coll. Bdv.

Acidalia balistaria Guen., Phal., i, 453.—"18^{mm}. Ailes à franges d'un gris-cendré; les supérieures aiguës à l'apex, d'un carné-jaunâtre ou argileux, avec deux lignes plus foncées parallèles entre elles et au bord, presque droites, peu apparentes, et une troisième extrabasilaire encore moins visible. Un petit point cellulaire. Inférieures arrondies, à bord sublestonné, d'un blanc-carné, marquées aussi de deux lignes grises et d'un point cellulaire. Dessous des quatre ailes concolore, plus clair, saupoudré d'atomes noirs, ayant, outre les deux lignes du dessus, une ombre médiane bien marquée et plus noire, et le point cellulaire mieux marqué. Antennes bien pectinées, à lames longues, mais extrêmement minces et aiguës au sommet, qui est terminé par des cils. ♂ semblable, mais plus claire.

"Amérique septentrionale, Géorgie. Trois ♂, une ♀. Coll. Bdv. et Lefebvre."

Acidalia demissaria (*Eois demissaria*) Hübner, Zutr., 563, 564, 1825; Guen., Phal., i, 466.—"21^{mm}. Ailes supérieures prolongées à l'apex, et à bord presque droit, inférieures petites, bien arrondies; les quatre d'un jaune-argileux sale, luisant, avec une large bordure d'un brun-violet, envahie au sommet de chaque aile par la couleur du fond, en sorte que, aux supérieures surtout, on distingue très-nettement la ligne qui servait à limiter cette bordure, laquelle est denticulée, légèrement arquée jusqu'à la 1, puis rentrante de là au bord interne. Ces mêmes ailes ont, en outre, une extrabasilaire arquée, et le fond teinté de brun-violet d'elle à la base. Un point cellulaire aux quatre ailes. Dessous plus ochracé, avec la bordure plus pâle, laissent la ligne plus apparente dans toute sa longueur.

"Amérique septentrionale. Un mauvais exemplaire. Coll. Bdv.

"Je ne puis rien dire du corps, des pattes ni des antennes, qui manquent. Cette espèce semble avoir de l'analogie avec *Ostrinotia* pour les dessins et les couleurs. La figure de Hübner a les ailes trop arrondies et les couleurs trop ternes."

Acidalia placidaria Guen., Phal., i, 469.—“18^{mm}. Ailes d'un gris-carné, avec trois lignes communes, parallèles, équidistantes, écartées, peu tranchées, et indiquées, surtout sur les nervures, en noirâtre: la dernière un peu éclairée de blanchâtre en arrière. Point de subterminale proprement dite. Frange concolore, sans point ni liséré. Un trait cellulaire aux quatre ailes, long, occupant toute la cellule, concolore, mais un peu saillant. Dessous d'un blanc sale, soyeux, avec les traces, à peine sensibles, de lignes fines et grises. Palpes appliqués contre le front, mais très-ascendants et dépassant le niveau du vertex.

“Amérique septentrionale. Une ♀. Coll. Bdv.”

Acidalia hepaticaria Guen., Phal., i, 471.—“18^{mm}. Ailes arrondies, d'un brun-testacé clair, avec des lignes et de larges bandes d'un rouge-violet obscur, qui occupent presque toute leur surface; l'une terminale et à peine coupée par une légère ligne de la couleur du fond, qui part du sommet; l'autre au milieu de l'aile, et, entre les deux, une fine ligne sinuee, divisant à peu près par moitié un large espace de la couleur du fond. Pas de points cellulaires ni terminaux. Dessous sans dessins, mi-parti de rose obscur et de blanc-paillé fondus, luisants.

“Amérique septentrionale, Baltimore. Une ♀. Coll. Gn.

“Facile à distinguer de toutes les autres par ses couleurs.”

Acidalia sublataria Guen., Phal., i, 474.—“19^{mm}. Ailes étroites et oblongues: les supérieures à apex prolongé, les inférieures arrondies; les quatre d'un gris-testacé clair, poudré d'atomes noirs, avec des dessins noirâtres bien marqués. L'ombre médiane épaisse, passant, aux quatre ailes, sous le point cellulaire, qui est bien distinct. La coudée sinuee, tremblée et composée de petits traits presque interrompus. Une seule ligne la suit, bien parallèle, et seulement moins marquée, éloignée du bord. Celui-ci est bordé de petits traits festonnés, contigus. La frange est longue, blanche et salie de nombreux atomes noirs. Front presque concolore.

“Amérique septentrionale. Une ♀. Coll. Gn.”

Acidalia temnaria Guen., Phal., i, 476.—“16^{mm}. Ailes légèrement festonnées d'un gris-de-poussière saupoudré de gris plus foncé jusque sur la frange, avec un liséré terminal de cette dernière couleur. Les deux lignes principales sont minces, écartées et presque perdues dans le sablé; mais l'ombre médiane se détache bien et touche le point cellulaire qu'elle laisse en

dedans aux quatre ailes. Dessous encore plus sombre que le dessus. Antennes garnies de cils longs et disposés deux à deux. Front large, d'un brun-noir, à vertex gris. Tibias postérieurs grêles et peu reculés. ♀ semblable.

"Amérique septentrionale. Un ♂, une ♀. Coll. Bdv. et Gu."

Acidalia myrmidonata Guen., Phal., i, 487, 1857,—"14^{mm}". Ailes entières, d'un beau blanc, à frange concolore et précédée de points noirs seulement dans la moitié supérieure, avec une ligne commune (la coudée) d'un brun ferrugineux, suivie au milieu, puis au bord interne des supérieures, de deux groupes d'atomes d'un brun-noir, et aux inférieures, d'une traînée d'atomes semblables. Un très-petit point cellulaire noir. Supérieures ayant, en outre, une extrabasilaire brune. Dessous blanc; les supérieures lavées de noirâtres. Front noir, à vertex d'un brun pâle. Antennes très-finement pubescentes. Tibias postérieurs aplatis et un peu contournés, blancs, avec le tarse de la moitié.

"Amérique septentrionale. Deux ♂. Coll. Bdv."

"Serait-ce la *Lautaria* de Hübner? [*Craspedia lautaria* Hübner!, Zutr., 539, 540, 1825.] Cette dernière paraît plus oblongue et beaucoup plus chargée de dessins."

Acidalia purata Guen., Phal., i, 488, plate 7, fig. 6,—"20^{mm}". Ailes entières, d'un beau blanc, bordées de traits noirs, contigus, avec une ligne commune (la coudée) sinueuse, noire, suivie de groupes d'atomes de même couleur, formant çà et là des taches arrondies. Un petit point cellulaire noir. Supérieures ayant parfois quelques traces d'une extrabasilaire. Dessous blanc, avec un point cellulaire et une série médiane de points noirs, parfois réunis en ligne. Antennes pubescentes. Front noir, à vertex blanc. Tibias postérieurs un peu élargis, une demi-fois plus longs que les cuisses, avec le tarse de la moitié—♀ semblable.

"Amérique septentrionale. Deux ♂, deux ♀. Coll. Mus. et Bdv."

Acidalia taturata Walk., List. Lep. Het. Br. Mus., xviii, 721, 1861, Plate 10, fig. 71,—"White. Hind tibiae with two long spurs. Wings thinly and minutely black-speckled: lines brownish: interior lines obsolete: middle line and exterior lines denticulated, the former more distinct than the latter, which is accompanied by black points: submarginal line indistinct: marginal

points almost obsolete. Fore wings acute. Hind wings broad; exterior border slightly bent; discal point black, distinct.

"Length of the body 4 lines; of the wings 10 lines

"The specimen here recorded is mutilated, and on that account the above description is incomplete.

"*a*. East Florida. Presented by E. Doubleday, Esq."

Acidalia impauperata Walk., List Lep. Het. Br. Mus., xxiii, 721, 1861. Plate 10, fig. 70 — "*Female*. Hoary, thickly brown-speckled. Front with a black band adjoining the vertex. Hind tibiae with four long spurs. Wings with brown lines; interior line indistinct; middle line broad, straight, passing over the discal points; exterior line also distinct and nearly parallel to the middle line; submarginal line almost obsolete; discal point and marginal points brown, the latter elongated; exterior border slightly convex. Fore wings somewhat rounded at the tips.

"Length of the body $3\frac{1}{2}$ lines; of the wings 10 lines.

"*a-c*. St. Martin's Falls, Albany River, Hudson's Bay. Presented by Dr. Barnston."

Acidalia restrictata Walk., List Lep. Het. Br. Mus., xxiii, 722, 1861. Plate 13, fig. 52 — "*Male*. Whitish. Head black; vertex white. Palpi short, obliquely ascending, black above. Antennæ pubescent. Hind tibiae incrassated, with almost obsolete spurs; hind tarsi more than half the length of the tibiae. Wings thinly and minutely black-speckled, with pale fawn-colored lines; interior line indistinct, slightly undulating; middle line straight, distinct, passing without the discal point in the fore wings, and within it in the hind wings; exterior line undulating, slightly dentate; two less distinct submarginal lines, nearly parallel to the exterior line; discal point and marginal points black. Fore wings hardly acute. Hind wings with the exterior border slightly bent.

"Length of the body 6 lines; of the wings 14 lines

"*a, b*. Nova Scotia. From Lieut. Redman's collection."

Acidalia compensata Walk., List Lep. Het. Br. Mus., xxiii, 724, 1861. Plate 10, fig. 69. — "*Male*. Brownish-cinereous. Head black; vertex white. Palpi porrect, very short. Antennæ pubescent. Hind tibiae incrassated, without spurs; hind tarsi short. Wings black-speckled; lines brown;

interior line almost obsolete, distinguished by a black mark on the costa of the fore wings; middle and exterior lines denticulated, slight, the latter ending in a black mark on the costa; submarginal line very indistinct; discal point and marginal points deep black, the former rather large. Fore wings acute. Hind wings with the exterior border slightly bent.

"Length of the body 3 lines; of the wings 10 lines.

"*a.* East Florida. Presented by E. Doubleday, Esq."

Acidalia timandrata Walk., List Lep. Het. Br. Mus., xxiii, 724, 1861. Plate 10, fig. 68.—"*Male*. Pale cinereous. Head blackish in front. Palpi short, porrect, hardly extending beyond the head, blackish above. Antennae minutely ciliated and pubescent. Hind tibiae much incrassated, without spurs; hind tarsi very short. Wings ample, very minutely black-speckled; lines pale rosy, a little darker than the ground line; interior and submarginal lines obsolete; middle line very indistinct; exterior line hardly distinct, slightly undulating and dentate; discal point black, minute; exterior border and fringe rosy. Fore wings very acute; costa rosy. Hind wings with the exterior border distinctly angular.

"Length of the body 5 lines; of the wings 14 lines.

"*a.* East Florida. Presented by E. Doubleday, Esq."

Acidalia rufilinearia Walk., List Lep. Het. Br. Mus., xxiii, 783, 1861.—"Allied to the 7th European group. *Male*. Bone-white. Head black in front. Antennae setulose. Hind tibiae incrassated, without spurs. Wings ample, interior and exterior lines reddish, the latter slightly undulating; submarginal line nearly obsolete; exterior border and fringe reddish; discal point and marginal points black, the latter very minute. Fore wings acute, with a blackish patch by the interior angle; interior line reddish, indistinct; costa reddish.

"Length of the body 4 lines; of the wings 10 lines.

"*a.* East Florida. Presented by E. Doubleday, Esq."

Acidalia ostentaria Walk., List Lep. Het. Br. Mus., xxiii, 784, 1861.—"Allied to the 17th European group. *Female*. Whitish-cinereous, black-speckled. Head blackish. Hind tibiae with two long apical spurs. Wings hardly elongated; lines undulating; interior and exterior lines black, very distinct, the former obsolete in the hind wings; middle and submarginal lines cinereous, indistinct; marginal lunules cinereous; marginal point and

discal point black, the latter large and very distinct. Fore wings rectangular at the tips; hind part of the exterior border rather oblique.

"Length of the body 3 lines; of the wings 8 lines.

"*a*. East Florida. Presented by E. Doubleday, Esq."

Acidalia magnificaria Walk., List Lep. Het. Br. Mus., xxiii, 784, 1861.—
"Allied to the 17th European group. *Female*. Cinereous. Head brown in front. Antennæ and legs slender. Wings elongate, thickly blackish-speckled; lines dark cinereous; interior line obsolete; middle line distinct, rather broad, very slightly undulating; exterior line slight, denticulated; submarginal line rather broad; marginal dots dark cinereous; discal point black, large. Fore wings acute; exterior border very oblique.

"Length of the body 3 lines; of wings 8 lines.

"*a*. East Florida. Presented by E. Doubleday, Esq."

Acidalia basipunctaria Walk., List Lep. Het. Br. Mus., xxiii, 785, 1861.—
"Allied to the 17th European group. *Female*. Very pale cinereous, with a slight rosy tinge. Palpi porrect, obtuse; third joint almost obsolete. Wings elongate, hardly speckled; submarginal line blackish cinereous, diffuse, dentate, obsolete toward the costa of the fore wings; the other lines obsolete; marginal points and discal points black; the former large, very distinct; fringe very long. Fore wings with a black basal point, and with blackish marks along the costa.

"Length of the body 2 lines; of the wings 6 lines.

"*a, b*. East Florida. Presented by E. Doubleday, Esq."

Acidalia retractaria Walk., List Lep. Het. Br. Mus., xxiii, 785, 1861.—
"Allied to the 17th European group. *Male and Female*. Cinereous. Head blackish in front. Antennæ stout, pubescent in the male. Abdomen of the male with a large apical tuft. Hind tibiae not incrassated, with two long apical spurs. Wings elongate, indistinctly speckled, slightly tinged with ferruginous about the lines; interior and exterior lines black, zigzag, the former indistinct, except toward the interior border of the hind wings; submarginal and marginal lines dark cinereous, undulating, parallel; marginal points ferruginous, rather large; discal point black. Fore wings slightly rounded at the tips.

"Length of the body 3 lines; of the wings 8 lines.

"*a-c*. East Florida. Presented by E. Doubleday, Esq."

Acidalia reconditaria Walk., List Lep. Het. Br. Mus., xxiii, 786, 1861.

"Allied to the 17th European group. *Male and Female*.—Body white. Head black in front. Antennæ of the male pubescent. Hind tibiæ of the male dilated, without spurs. Wings ample, very thinly black-speckled, with cinereous more or less undulating and dentate lines; exterior line more distinct than the others; submarginal line broad, double; discal point and marginal points black, small. Fore wings acute. Hind wings with the exterior border slightly angular in the middle.

"Length of the body 5–6 lines; of the wings 16 lines.

"*a*. New York. Presented by E. Doubleday, Esq. *b*. East Florida. Presented by E. Doubleday, Esq.

Acidalia obtusaria Walk., List Lep. Het. Br. Mus., xxiii, 786, 1861.—

"Allied to the 17th European group. *Female*.—Whitish. Head black in front. Hind tibiæ with apical spurs. Wings ample, thinly black-speckled; interior, middle, and submarginal lines cinereous, indistinct; exterior line black, denticulated; marginal points on the fringe and discal point black, the latter rather large.

"Length of the body 3–3½ lines; of the wings 11–12 lines.

"*a, b*. East Florida. Presented by E. Doubleday, Esq."

Acidalia violacearia Walk., List Lep. Het. Br. Mus., xxiii, 786, 1861.—

"New group. *Female*.—Violet slate-color. Head black in front. Wings elongate, hardly black-speckled; interior, middle, and exterior lines black, slight, denticulated, partly interrupted; submarginal line pale cinereous; discal point and marginal points black, the latter on the fringe; under side with the markings almost obsolete. Fore wings slightly rounded at the tips.

"Length of the body 2½ lines; of the wings 8 lines.

"*a*. East Florida. Presented by E. Doubleday, Esq."

Acidalia mensurata Walk., List Lep. Het. Br. Mus., xxxv, 1621, 1866.—

"*Male*.—Whitish. Head black, except the vertex. Palpi hardly ascending, black above, extending very little beyond the head. Antennæ minutely pubescent. Hind tibiæ incrassated; hind tarsi very short. Wings broad, with a black point in the disk; a dull pale-ochreous slightly undulating line, which is on the outer side of the point in the fore wings and on the inner side of it in the hind wings; an exterior more slender brownish zigzag line; two

undulating very pale ochraceous submarginal lines, which are more indistinct than the first line; marginal points black, very minute. Fore wings hardly acute; costa slightly rounded toward the tip; exterior border convex, moderately oblique. Hind wings with the exterior border slightly angular in the middle. Length of the body 6 lines; of the wings 15 lines. It is larger than *A. restrictata*, and in the latter the postmedial line of the wings is ochraceous. The antemedial line of *A. reconditaria* is less slender and the postmedial line is more dentate. North America."

Acidalia continuaria Walk., List, xxxv, Suppl., 1622, 1866.—"*Male*. Whitish cinereous. Head black; vertex white. Palpi obliquely ascending, black above, not rising so high as the vertex. Antennae minutely pubescent. Hind tibiae incrassated; hind tarsi very short. Wings broad, thinly and minutely black-speckled; four dull pale ochraceous lines, first line antemedial, nearly straight; second, third, and fourth lines postmedial, zigzag; marginal points black, extremely minute. Fore wings slightly acute; costa slightly rounded towards the tip; exterior border slightly convex, moderately oblique. Hind wings with the exterior border hardly angular in the middle. Length of the body 5 lines; of the wings 13 lines. North America."

Acidalia consecutaria Walk., List, xxxv, Suppl., 1623, 1866.—"*Male*. Pale cinereous. Head black; vertex white. Palpi porrect, black above, extending very little beyond the head. Antennae densely setulose. Thorax fawn-colour along the fore border. Hind tibiae slightly incrassated; hind tarsi long. Wings broad, very minutely brown-speckled; two zigzag brownish lines, one antemedial, the other postmedial; two extremely indistinct zigzag pale ochraceous lines between the second line and the exterior border; a brown discal point, which, as well as the lines, is more conspicuous on the under side; marginal points blackish, much elongated transversely. Fore wings hardly acute; costa and exterior border very slightly convex, the latter moderately oblique. Hind wings with the exterior border regularly rounded. Length of the body $4\frac{1}{2}$ lines; of the wings 12 lines. North America."

Acidalia congrua Walk., List, xxxv, Suppl., 1623, 1866. —"*Male*. Whitish. Body with a pale ochraceous tinge. Palpi porrect, broad, hardly extending beyond the head; third joint very minute. Antennae smooth, rather stout. Abdomen hardly extending beyond the hind wings; apical tuft rather large.

Legs slender; hind tibiae incrassated; hind tarsi short. Wings broad, thickly and minutely ochraceous-speckled; three ochraceous zigzag lines, the third postmedial; marginal points brown, very minute. Fore wings slightly acute; exterior border slightly convex and oblique. Length of the body 5 lines; of the wings 12 lines. North America."

Acidalia sobria Walk., List, xxxv, 1621, 1866—"Male. Pale cinereous. Head black; vertex white. Palpi porrect, black above, hardly extending beyond the head. Antennae densely setulose. Thorax fawn-colour along the fore border. Abdomen with a rather large apical tuft. Hind tibiae incrassated; hind tarsi short. Wings broad, with seven slightly dentate cinereous lines, of which the three last are most distinct; a brown point on the disk. Fore wings slightly acute; exterior border slightly convex, moderately oblique. Length of the body 4 lines; of the wings 11 lines. North America."

Acidalia jarillifera Walk., List, xxxv, 1624, 1866—"Male. Dark cinereous. Head blackish; vertex dark cinereous. Palpi blackish, porrect, not extending beyond the head. Antennae densely setose. Hind tibiae not incrassated. Wings rather narrow, minutely black-speckled, with four lines; first line blackish, diffuse, undulating; second black, dentate, interrupted between the teeth; third and fourth cinereous, zigzag; marginal festoon brownish; a black antemedial point in the disk. Fore wings slightly acute; exterior border slightly convex, rather oblique. Length of the body $2\frac{1}{2}$ lines; of the wings 8 lines. North America."

Acidalia repletaria Walk., List, xxxv, 1624, 1866—"Male. Dark cinereous. Head black, except the vertex. Palpi porrect, black above, not extending beyond the head. Antennae densely setose. Abdomen brown, cinereous at the base and at the tip; a cinereous band in the hind border of each segment. Hind tibiae slender; hind tarsi long. Wings brown-speckled, rather narrow, with five brown lines; first line near the base, incomplete; second and fourth slightly undulating, rather broad; third composed of points; fifth paler, indistinct; marginal points brown, transversely elongated. Fore wings hardly acute; exterior border slightly convex, rather oblique. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines. North America."

Acidalia? albifera Walk., List, xxxv, Suppl., 1625, 1866.—“*Female*. White. Palpi porrect, slender, not extending beyond the head. Antennæ and legs slender. Abdomen shorter than the interior border of the hind wings. Legs slender. Wings semihyaline, rather broad, with four indistinct zigzag interrupted pale ochreous lines. Fore wings slightly acute; exterior border convex, moderately oblique. Hind wings with the exterior border very slightly angular in the middle. Length of the body $2\frac{1}{2}$ lines; of the wings 9 lines. North America.”

Macaria fidonaria Walk., List Lep. Het. Br. Mus., xxxv, 1654, 1866 — “*Male*. Cinereous, thickly brown-speckled. Palpi blackish, porrect, stout, extending rather beyond the head; third joint very minute. Antennæ broadly pectinated, except at the tips. Abdomen as long as the interior border of the hind wings. Hind tibiae hardly dilated, with four short spurs. Wings with a broad blackish band near the base, and with a postmedial undulating blackish line; a blackish middle dot; fringe alternately blackish and cinereous. Fore wings hardly acute; two blackish more or less connected sometimes ferruginous-varied patches between the postmedial line and the exterior border, which is convex and moderately oblique. Hind wings with the exterior border hardly angular in the middle.

“Length of the body $3\frac{1}{2}$ lines; of the wings 16 lines.

“*a, b*. North America. From Mr. Carter’s collection.”

Acidalia ferraminaria Zeller, Verh. Bot. Zool. Ges. Wien, 478, 1872.—“*Pedibus* posticis ♂ mancis ♀ 4 calcaratis; alis rufescenti-ochraceis vel ochraceo-rufescentibus, anterioribus fascia media nigricanti strigaeque punctorum majusculorum dentata nigra per posteriores continuata. ♂ ♀.

“Die mehr noch als bei *Straminata* etc. verkümmerten ♂ Hinterbeine beweisen, dass diess eine echte *Acidalia* ist, der sich aber, wenn man diesen Umstand und die Färbung berücksichtigt, in der Gesellschaft der europäischen Arten kaum ein passender Platz anweisen lässt.

“Grösse kaum wie *Muricata*. Körper röthlich ocherhell oder ocherhellbrüthlich. Gesicht etwas gebräunt. Taster kurz, spitz, röthlichgelb. Fühler rothlichgelb, beim ♂ durch feine, braune, behaarte Kamuzähne doppelt gefiedert. Hinterleibssegmente am Anfänge mehr oder weniger braunstaubig. Beine röthlichgelb; die ♂ Hinterbeine ganz verkümmert, klein und blassgelblich; die Schiene ein wenig länger als der Schenkel,

schwach verdickt; der Fuss aus zwei Gliedern bestehend, dessen erstes so lang wie die Schiene, aber etwas dünner, das zweite sehr kurz, dünn und zugespitzt ist. Beim ♀ sind die Hinterbeine regelmässig ausgebildet mit 2 Paar ansehnlichen Dornen, deren oberstes bei $\frac{3}{4}$ angesetzt ist.

“Vorderflügel 4 - $4\frac{1}{2}$ lang, mit deutlicher Spitze, vor welcher der Vorderrand etwas convex ist. Grundfarbe wie die des Körpers. Die Mittelbinde wird gebildet durch eine schwarze, wellige, auf der Median- und Subdorsalader winklige, grobe Querlinie, die auf der Aussenseite in ansehnlicher Breite von einem röthlichbraunen Schatten begleitet ist, dessen Aussenrand auch in einigen scharfen Ecken hervortritt. Ein schwarzer Mittelpunkt fehlt. In der Mitte zwischen dieser Binde und dem Hinterrande ist eine Querreihe grober, schwarzer Punkte, die im Innenwinkel endigt und bei $\frac{3}{4}$ und unter ihrer Mitte einen ausspringenden Winkel bildet; die Punkte sind hier und da durch feine, schwärzliche Linien verbunden. Den Hinterrand entlang zieht eine Reihe schwarzer, strichförmiger Punkte, die nicht so scharf wie jene sind und bei dem einen dunkelröthlichen σ in dunklem Staube, der den Hinterrand nebelartig begleitet, fast verschwinden. Frausen wie die Grundfarbe oder etwas violettgrau. Die schwarzen groben Punkte haben auf allen Flügeln etwas Glanz.

“Hinterflügel mit gerundetem Hinterrande, doch ziemlich deutlichem Analwinkel, und von gleicher Grundfarbe wie die Vorderflügel. Nur auf dem Innenrande zeigen sich vor der Mitte die Anfänge von zwei schwärzlichen Querstreifen. Die Querreihe schwarzer Punkte der Vorderflügel ist als Fortsetzung vollständig vorhanden und bildet in ihrer Vorderhälfte einen einspringenden Winkel. Zeichnung des Hinterrandes weniger deutlich als bei den Vorderflügeln.

“Unterseite lebhaft röthlich ochergelb. Alle 4 Flügel haben schwarze Striche auf den Queradern, das ♀ die deutlichsten. Die Querreihe schwarzer Punkte ist recht deutlich, ebenso die Hinterrandspunkte.

“Vaterland: Texas (Boll.) 2 ♂, 1 ♀ in meiner Sammlung.”

EPHYRA Duponchel. Plate 4, fig. 4.

Cosymbia Hübn., Verz., 302, 1818.

Leucophthalmia Hübn., Verz., 302, 1818.

Codonia Hübn., Verz., 302, 1818.

Cabera Treits. (in part.) Schm. Ent., vi. c., 343, 1827.

Cyphophora Steph., Nomencl. Br. Ins., 44, 1829; “Cat. n., 127, 1829.”

- Ephyra* Dup., Lep. France, viii (iv), 108, 1829; (v), 20, 1830.
 Boisd., Gen. Ind., 220, 1840.
 H. Sch., Schin. Eur., iii, 1847.
Ephyra Steph., Cat. Br. Lep., 178, 1850.
Zonosoma Lederer, Verh. Bot. Zool. Ges. Wien, 194, 1853.
Ephyra Guen., Phal., i, 405, 1857.
 Walk., Lep. Het. Br. Mus., xxii, 624, 1861.

Head rather broad in front; the front being sometimes shorter than broad. Palpi long, acute, extending more than usual in front; third joint long, acute. Antennæ slightly pectinated on the basal two-thirds. Fore wings much as in *Acidalia*, but scarcely subfalcate; the costa straight; apex acutely rectangular; outer edge with an almost imperceptible angle. Hind wings short, the outer edge not very convex, slightly bent. Venation much as in *Acidalia*, the subcostal cell and venules the same, except that the three first subcostal venules are of the same length, the first arising remotely from the subcostal cell. Abdomen long and slender. Hind legs long and slender; tarsi nearly as long as the tibiae. The species are usually whitish or reddish-brown, with large discal ringlets.

This genus differs chiefly from *Acidalia* in the antennæ being always pectinated, in the much longer palpi, and the slightly different venation. So closely allied is it to *Acidalia* that I see no reason for separating it, as Guenée does, from the *Acidaliinæ* as the type of a separate "family". It has no affinities with the *Geometrinæ* beyond the wide front and long palpi.

Larva and pupa—"Caterpillars elongated, cylindrical, without tubercles; head as broad as the prothoracic ring, flattened in front, and a little bifid at the summit; living exposed on trees and holding the body in repose folded like a swan's neck. Chrysalids truncated anteriorly, regularly conical posteriorly, suspended in the air by an anal thread and attached by a transverse line."—Guenée

Hübner, however advanced in his views of genera, evidently had little better ideas of the true generic relations of this group of species than of the genus *Acidalia*. Lederer rejects *Ephyra* because he says that it has been pre-occupied as a genus of *Acalephæ*; but the name *Ephyra* of Péron and Lesson (1809), was conferred on an early phase of *Aurelia*, and therefore may be retained.

Synopsis of the Species.

- | | |
|--|--------------------------|
| White, with four lines on the front wings..... | <i>E. pendulinaria</i> . |
| Light fawny-brown; two rows of dark dots..... | <i>E. myrtaia</i> . |

EPHYRA PENDULINARIA Guenée. Plate 10, fig. 72. Plate 13, figs. 11, 11a, 11b, pupa.

Ephyra pendulinaria Guen. ? Phil., i, 111, 1855.

Walk., Last Lep. Het. Br. Mus., xxii, 631, 1861.

Acidalia quadrangulata Walk. ? ? Last Lep. Het. Br. Mus., xxvi, 1595, 1862.

3 ♂ and 3 ♀.—Antennae moderately pectinated in the male. Body and wings white, speckled with dark gray or blackish. Head white on the vertex, brown in front; palpi white; antennae white above; pectinations white. Fore wings with an inner curved line of venular black spots; a middle sinuous, indistinct, dusky shade half-way between the discal ringlet and the outer parallel curved line of venular blackish dots; a submarginal, dark, slightly-scalloped shade; marginal row of black dots distinct on both wings. Hind wings with four lines and shades, as in the anterior pair, but the middle (second) shade touches the large discal ringlet. Beneath, white. Fore wings slightly dusky in the middle of the wing; the outer row of black dots present, but less curved than above and situated farther from the edge of the wing. Hind wings almost pure white, with a faint outer row of dots. The marginal row of dots alike on both wings. Legs white, dusky in front on the anterior pair.

Length of body, ♂, 0.36, ♀, 0.36–0.38; of fore wing, ♂, 0.47, ♀, 0.43–0.50; expanse of wings, 1.00 inch.

Boston and Andover, Mass. (Sanborn); Brookline, Mass., August 6 (Shurtleff); Cambridge, Mass., May 25, July 26 (H. K. Morrison); Brooklyn, N. Y. (Graef); West Farms, N. Y. (Angus); New Jersey (Sachs); Philadelphia, Pa. (Amer. Ent. Soc.); Maryland (Scudder).

This species may at once be known by its white color and large discal ringlets and the mesial shade. It is nearly related to the European *E. pendularia*. Like the following species, it varies considerably in size.

Larva.—"Light green with longitudinal white lines, and dotted with white spots. A dorsal and three subdorsal lines; the dorsal straight, but the others broken and irregular, the stigmatal edge wrinkled, the white spots irregularly scattered. Body beneath with the white lines interrupted. The last segment with the anal prolegs and tip of the first pair of prolegs slightly reddish. Thoracic legs pale greenish, black at the tips. A few scattered hairs on the body. Head faint reddish marbled with whitish, with two white stripes. Length 0.40; thickness 0.12 inch. It feeds on *Complanata asplenifolia* in Massachusetts.

"When about to transform it slings itself in a thread which crosses its body between the 6th and 7th segments, and closes its anal prolegs tightly in a mass of silk spun at this point, and on the 17th of July changed to a pupa. On the 12th of August I found a chrysalis just ready to turn; it was fastened to the midrib of a leaf near the middle, with the threads of the swing well separated and well pushed under."

Pupa.—"Light green, a black stripe broken twice towards the end on each side, along the hinder margin of the wing. Two protuberances, one at the base of each wing, white, brownish at base; tail piece almost colorless, tip red. Abdominal segments of a lighter color than the rest, with dots of a lighter tint; anterior half of each abdominal segment punctate; posterior half minutely striate; a thread crosses the body upon which it rests suspended; the thread splits into two, being fastened by four points. It is slightly roofed on the back."—Scudder.

EPIHYRA MYRTARIA Guenée. Plate 10, fig. 73.

Ephyra myrtaria Guen. 11, Phal., i, 408, Pupa, pl. 2, fig. 7, 1857.

Walk. 11, Cat. Lep. Het. Br. Mus., xxii, 631, 1861.

3 ♂ and 4 ♀.—Of the same form as the preceding, but the antennæ rather more pectinated. Body and wings uniformly pale tawny-brown; vertex of head and antennæ slightly paler than the rest of the body, while the front is considerably darker. Both wings with a large, blackish, discal ringlet, centered with white, those on the hind pair usually (not always) larger. Fore wings with an inner curved row of fine venular black dots and an outer curved row of black venular dots, the discal spot being half-way between the two lines. Hind wings with two similar lines. A marginal row of dark fine dots on both wings. Beneath, flesh-colored; hind wings slightly paler than anterior pair; fringe on both wings decidedly darker than wings themselves. Discal dots pinkish; margin of both wings speckled finely with pinkish scales. Body and legs whitish testaceous. Exterior of front legs dull reddish.

Length of body, ♂, 0.35–0.38, ♀, 0.38; of front wing, ♂, 0.42–0.47, ♀, 0.43–0.45; expanse of wings, 1.00 inch.

Boston, Mass. (Sanborn); Princeton, Mass., August 12 (Scudder); West Farms, N. Y. (Angus); New Jersey (Sachs); Pennsylvania (Clemens); Philadelphia, Pa. (Amer. Ent. Soc.); Demopolis, Ala., July and August (Grote); "Illinois, Georgia" (Walker).

This is our more common species of the genus, and is characterized by the tawny-brown hue, tinged with carneous, by the two common lines of small, black, venular dots, the dark discal ringlets centered with white, and by the pale under side tinted with flesh red.

Larva and pupa.—Guenée describes the caterpillar as of a clear green with yellowish incisions; the head, the anal region, and the feet reddish-yellow. On the fifth segment are two small, black, dorsal points. The chrysalis (figured by Guenée) is deep green, with a lateral white line edged with faint rose on the wings and anal extremity.

Desiderata.

Ephyra culicaria Guen., Phal., i, 407, 1857. "18^{mm}. Ailes d'un gris-testacé clair, avec la frange rose et deux séries de petits points noirs. Un petit anneau cellulaire au centre, plus blanc que le fond, et quelquefois une ombre médiane rougeâtre; le tout ordinairement très-fin et peu saillant. Dessous sans dessin: les supérieures plus rosées, les inférieures plus blanches. Vertex concolore, avec le front d'un brun-cannelle clair.

"Géorgie américaine. Trois ♂. Coll. Lefebvre et Gn.

"Les ailes inférieures de cette petite espèce n'ont pas l'angle anal prolongé comme la *Rudimentaria*; le bord terminal est seulement un peu concédé et la côte droite. Elle ressemble, en petit, à nos espèces européennes."

Arrhostia lumenaria Hübn.-Geyer, Zuträge, 35, fig. 757, 758, 1832.—This species, or one allied to it, has been raised by Abbot, and the following description has been drawn up from his colored MS. drawing: Body long and slender; head narrower than the body. Head, feet, and abdomen testaceous. Body grass-green, with two conspicuous, thin, dorsal, black spots just in front of the middle. Pupa attached to the stem of the plant, as in *Ephyra*. It is green, purplish along the hind edge of the wing and at the end of the body. Food-plant, *Psoralea melitoides*. Plate 13, fig. 22, 22a.

EUPHYRA Packard—Plate 4, fig. 5.

Euphyra Pack., Fifth Ann. Rep. Peab. Acad. Sci., 73, 1873.

This genus is allied to *Ephyra*, notwithstanding that it has two pairs of well-developed spurs on the hind tibia; though M. Guenée regards one pair of poste-

rior tibial spurs as characterizing the group "*Ephyridæ*". It differs from *Ephyra* in the palpi being much longer, the third joint projecting far beyond the head, while the fore wings are much longer, more acute, and the hind wings are rather longer, fuller, and rounder at the apex, and delicately scalloped. The wings are thinner and the moth slighter and more delicate than in *Ephyra*, its nearest ally. The venation differs from that of *Ephyra* mainly in the fifth subcostal venule arising just within the origin of the first subcostal but on the opposite side of the main vein. Unfortunately, the male has not yet occurred, so that this diagnosis must be quite imperfect.

EUPHYRA SERRULATA Packard. Plate 10, fig. 74.

Ephyra serrulata Pack., Fifth Rep. Peab. Acad. Sc., 73, 1873.

4 ♀.—Pale reddish-ash-brown: head and palpi clearer, pale reddish-brown. Both wings crossed by two remote dark hair-lines, sinuate and wavy, the inner acutely angulated on the costa, and indented on the median vein. An outer line curved considerably outward between the costa and lowermost branch of the median vein, the line most of its length parallel to the outer edge. Discal dot distinct, oval, white, circled with dull rust-red on the fore wings, with a darker circle on the hind wings. Fringe long, concolorous with the wings, with a black line at base. Beneath, with minute discal white dots. Wings paler than above, not speckled with brown, clear, with a single, common, outer, curved line, and a dark line at base of the fringe.

Length of body, ♀, 0.30; of fore wing, ♀, 0.33–0.40; expanse of wings, 0.77 inch.

Lawrence, Kans. (Snow): Texas, May and June (Belfrage).

This moth may be distinguished from the species of *Ephyra*, to which it is allied in its coloration and style of marking, by the delicately-scalloped or serrate hind wings, the pointed primaries, and the two wavy, curved, dark lines. It is marked beneath much as in *Ephyra myrtaria* Guenée.

Subfamily GEOMETRINÆ Guenée.

Geometrini Guen., MSS. See Dup., Cat., 169, 1844.

Subtribe *Chlorochromites* Dup., Cat. Lep. Eur., 223, 1844.

Subfamily *Geometridi* Steph., Cat. Br. Lep., 169, 1859.

Family *Geometrida* Guen., Phal., i, 332, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 199, 1861.

Head rather short, broader in front than in the *Acidalinæ*, the front often being very broad near the antennæ and narrowing anteriorly. Male

antennae moderately pectinated on the basal three-fourths. Palpi very unequal in length in the sexes, usually short and slender; the third joint short and conical, scarcely reaching beyond the front in the male while they are longer in the female, and, as in *Synchlora*, of extraordinary length and very slender, including the third joint. The wings are of very uniform shape, the fore wings being triangular with the costa, rather straight; the apex subacute and the outer edge slightly convex, sometimes slightly bent or very angular. Hind wings round or angular, sometimes partly aborted (*Dyspteris*). Venation: usually no subcostal cell present, only in *Dyspteris*, and partially formed in some species of *Nemoria*. The costal venule anastomoses with the subcostal; six well-marked subcostal venules; the independent venule much nearer the sixth subcostal than usual, the posterior discal venule consequently much longer and more curved than usual. The origin of the first median is usually continuous with the main vein. Hind legs with the tibiae either long and with a dense tuft or projection beyond the end, where the tarsi is very short, or the tibiae are as usual and the tarsi equal to them in length. Sometimes but a single pair of tibial spurs.

The species are green, usually with two common white lines and sometimes the front of the head and fore tibiae are a reddish or pink.

Synopsis of the Genera.

A. Posterior discal venule not much curved:

Hind wings partially aborted; fore wings large.....	<i>Dyspteris</i> .
Hind wings rounded; antennae broadly pectinated.....	<i>Lucrostis</i> .
Hind wings angular; antennae simple.....	<i>Nemoria</i> .
Hind wings very angular; fore wings acute; antennae pectinated.....	<i>Iodis</i> .

B. Posterior discal venule much curved:

Like <i>Chlorosea</i> , but with more rounded hind wings.....	<i>Annemoria</i> .
Species of large size; hind wings produced toward the apex; antennae with long pectinations.....	<i>Chlorosea</i> .
Head broad in front; female palpi very long; hind wings rounded.....	<i>Synchlora</i> .
Like <i>Synchlora</i> , but abdomen ornamented with raised white spots circled with red; hind wings rounded.....	<i>Racheospila</i> .
Front of head narrow; palpi short; hind wings angular; abdomen spotted with white or red, or with a simple dorsal white line.....	<i>Aplodes</i> .
Front broader than in <i>Aplodes</i> ; outer edge of fore wings more oblique; hind tibiae not swollen.....	<i>Anaploides</i> .
Palpi long and stout; third joint slender; hind wings rounded, extending farther than usual beyond the tip of the abdomen; wings with broad, white, straight bands.....	<i>Grametra</i> .

DYSPTERIS Hübner. Plate 4, fig. 6.

Dyspterus Hübn., Verz., 286, 1818.

H.-Sch., Ausserer., Schm., 1854-58.

Guen., Phal., i, 361, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 557, 1861.

Head rather large; front large and prominent, not narrowing anteriorly. Palpi not reaching beyond the front; second joint broad, though very distinct from, and narrower than, the first; third minute, short, conical, not so long as the second joint is wide. Antennæ pectinated in the male rather broadly on the basal two-thirds. Fore wings very large; costa much arched; apex much produced; outer edge very oblique; inner edge but little more than half as long as the outer. Hind wings much aborted, small, regularly triangular; outer edge slightly convex; apex subrectangular; the wings reach as far as the tip of the abdomen. Venation: fore wings with a large subcostal cell; the second subcostal but little longer than the third; fifth subcostal venule long, thrown off from the subcostal cell. In the hind wings, the costal area is very broad.

This peculiar genus differs from all others of the subfamily in the great difference in size between the wings, the anterior pair being very large and the hinder diminutive and triangular in outline, the outer edge being very straight. The species only occur in the New World.

DYSPTERIS ABORTIVARIA Herr.-Sch. Plate 10, fig. 75.

Dyspterus abortivaria H.-Sch., Ausserer., Schm., 62, fig. 346, 1854-58.

Guen., Phal., i, 363, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 557, 1861.

3 ♂ and 2 ♀.—Pea-green; head and thorax rather darker. Antennæ green above on the basal half, white beyond, pectinations testaceous. Palpi green; thorax green above and beneath, except the hind pair of trochantines and coxæ, which are concolorous with the pale-yellowish abdomen. Fore wings crossed by two parallel, oblique, white, moderately wide lines, straight, not waved; the inner fading out before reaching the costa, disappearing near the distinct white discal dot; the outer line parallel with the outer edge, slightly bent before reaching the costa; fringe green. Hind wings with a single line, rather broad and diffuse. Beneath as above, but with two broad, diffuse lines, one submarginal on the fore wings; discal dots much

larger and more distinct than above. Hind wings with the single line diffuse. Legs green, washed with white; hind femora yellowish below.

Length of body, ♂, 0.42, ♀, 0.40; of fore wing, ♂, 0.52-0.60, ♀, 0.58; expanse of wings, 1.10-1.20 inches.

Montreal, Canada (Lyman); Boston, Mass., Andover, Mass., July (Samborn); Philadelphia, Pa. (Amer. Ent. Soc.); New Jersey (Sachs); Demopolis, Ala. (Grote).

This interesting species varies but slightly, and may always be separated from all the other green Geometrids by the great inequality in the size of the wings.

EUCROSTIS Hübner. Plate 4, fig. 7; plate 6, fig. 22.

Eucrostis Hübner, Verz., 283, 1818.

Geometra Treits., (in part.) Schm. Ent., v, 430, 1825.

Eidonia Dup., (in part), Lep. France, viii (iv), 407, 1829.

Boisd., Gen. Ind., 179, 1840.

Chlorochroma Dup., Cat., 224, 1844.

Eidonia H.-Schl., Schm. Ent., iii, 7, 1847.

Eucrostis Lederer, Veth. Bot. Zool. Ges. Wien, 189, 1853.

and *Nemoria* Guen., (in part), Phal., i, 366, 345, 1857.

Walk., (in part), List Lep. Het. Br. Mus., xxii, 565, 1861.

Front rather narrower anteriorly than in *Nemoria*. Palpi rather large, projecting well in advance of the front, the second joint rather large and bushy. Male antennae with rather long pectinations, terminal fourth simple; in the female simple, finely serrated. Fore wings with the costa straight, the apex rather obtuse. Hind wings much rounded. Fringe on both wings unusually long. Venation: the costal region is rather wide, the subcostal cell is sometimes open (*chloroleucaria*); the posterior discal venule is very oblique, but not much curved; the origin of the first median venule is a little removed from that of the second, while in *Nemoria* the origins of the two are blended. Hind legs: tibiae long, with a large brush of hairs; tarsi one-third to one-half as long as the tibiae (*chloroleucaria*), or a little longer than the tibiae (in the European *herbaria*). Abdomen moderately long. Coloration: green, with white firm lines, the outer common to both wings, broad and conspicuous; fringe whitish, rarely deep red.

This genus, some species of which, as our common *chloroleucaria* and the European *herbaria*, have been referred to *Nemoria* by Guenée, is readily distinguished from the other *Geometrinae* by the large bushy palpi, well-pectinated antennae, the triangular fore wings with their straight costa and

obtuse apex, and the much-rounded hind wings, as well as the long fringe on both pairs. In the European *E. herbaria*, the subcostal cell is closed, but in several specimens of our *E. chloroleucaria* it is open. The legs differ greatly in the length of the tarsi in the different species, but the shape of the wings is very constant.

Synopsis of the Species.

Lines narrow, very distinct; outer line curved; palpi short.....*E. zelleria*.
 Lines broad, distinct; outer line straight; palpi rather long.....*E. chloroleucaria*.

EUCROSTIS ZELLERIA, *sp. nov.* Plate 10, fig. 76.

6 ♂ and 1 ♀.—Pea-green. Head and antennae whitish-ochreous; front deep green. Palpi and legs pale ochreous. Fore wings pale ochreous on the costa: two parallel, very distinct, whitish-ochreous lines, both curved on the costal region, much alike, and nearly parallel and both a little wavy. The outer line continued on to the hind wing, and rather suddenly bent a little outward in the middle of the wing, the similar line in *chloroleucaria* being straight. The fringe on both wings is paler than the wings. Beneath greenish, washed slightly with ochreous; costa of fore wings ochreous.

Length of body, ♂, 0.27, ♀, 0.33; of fore wing, ♂, 0.30, ♀, 0.40; expanse of wings, 0.60–0.84 inch.

Waco, Texas, August 8–21 (Belfrage, Mus. Peab. Acad. Sc.).

This exquisite species differs from *E. chloroleucaria*, being less strigated with white, and in the head being green in front instead of reddish; in the outer line being curved like the inner on the costal region instead of straight; and in the single line on the hind wings being suddenly bent in the middle. It is more nearly allied to the European *herbaria* than *chloroleucaria*. The hind legs are as in *chloroleucaria*, however, with a large brush of hairs; hind tarsi half as long as the tibiae.

EUCROSTIS CHLOROLEUCARIA Packard. Plate 10, fig. 77.

Xenoria chloroleucaria Guen., Phal., i, 354, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 534, 1861.

10 ♂ and 10 ♀.—Pale pea-green, with numerous whitish strigae. Head pale whitish on the vertex; front and palpi ochreous. Antennae whitish. Fore wings with two broad whitish lines; the inner situated half-way between the outer and the base of the wing, a little curved; the outer more

distinct, straight, and continued on to the hind wing, the only marking on the wing. Costa of fore wing whitish; fringe on both wings paler greenish than the wing, sometimes almost whitish. Wings beneath paler than above, fore wings greenish, with a whitish, diffuse, outer band; costa washed faintly with ochreous. Legs deep ochreous, sometimes with a reddish tinge.

Length of body, σ , 0.30–0.35, ♀ , 0.30; of fore wing, σ , 0.32–0.40, ♀ , 0.12–0.15; expanse of wings, 0.73–0.90 inch.

Montreal, Canada (Lynn); Campton, N. H., June (Walker); Brunswick, Me. (Packard); Portland, Me. (Morse); Dublin, N. H., Milford, Mass. (Harris Coll. Mus. Bost. Soc. Nat. Hist.); Nahant, Mass. (Moering); Natick, Mass. (Stratton); Boston, Mass., June and September (Sanborn); Brookline, Mass., May 31 (Shurtleff); Cambridge, Mass. (Verrill); Amherst, Mass., September (Packard, Mus. Peab. Acad. Sc.); Peabody, Mass. (Mrs. Colcord); Springfield, Mass., June 18 (Dimmock); West Farms, N. Y. (Augus, Mus. Peab. Acad. Sc.); Brooklyn, N. Y. (Graef); New Jersey (Sachs); Harrisburgh, Pa., August 20 (Shurtleff); Easton, Pa. (Stultz); Central Missouri (Riley); Lawrence, Kans. (Snow); Demopolis, Ala. (Grote); Waco, Texas, May 4, October (Beltinge, Mus. Peab. Acad. Sc.); Dallas, Texas, April 13, May 5 (Boll, Mus. Peab. Acad. Sc.); New Orleans, La. (Mus. Peab. Acad. Sci.).

From the dates given above, it appears that this moth is double-brooded. One of our most common green moths, and easily recognized by the ochreous front and palpi, pale whitish-green wings, and the two broad, parallel, whitish lines; it readily fades out, so that the lines are almost effaced. Some appear as if minutely mottled with whitish flecks. Texan specimens do not seem to vary from New England ones. The distance between the two lines varies considerably. This common and widely-spread species is easily recognized by the pale-green body and wings, the ochreous front and palpi, and by the broad, common, whitish band, also its small size and rounded hind wings. It seems to be double-brooded, as it appears in Massachusetts in June and again in September. It varies but little, sometimes differing in the depth of the green shade, often occurring in collections almost white. It is closely allied to *E. barbaria* of Southern Europe.

Larva.—Mr. L. W. Goodell has raised this moth, and writes me that the caterpillar was found on the red raspberry. "It is green, marked obscurely with paler green, and when fully grown measured an inch in length. July 24th it fastened itself to the bottom of the box in which it was confined and

changed to a chrysalis without making a cocoon. The chrysalis was also green with a row of black dots on each side. The moth appeared August 10th." According to a MS. drawing of Abbot's, the body is very slender and cylindrical, smooth, somewhat thickened on the end of the abdomen. Head no wider than the body; it is reddish, while the body is grass-green, with no markings. Food-plant, *Helenium autumnale*.

NEMORIA Hübner. Plate 4, figs. 8, 8a

Nemoria Hübner, Verz., 285, 1818.

Geometra Treits. (in part), Schum. Eur., v, 430, 1825.

Hemithoa Dup. (in part), Lep. France, viii (iv), 233, 1829.

Geometra Boisdu., Gen. Ind., 179, 1840.

Chlorochroma Dup., Cat., 224, 1844.

Geometra H.-Sch., Schum. Eur., iii, 7, 1847.

Nemoria Lederer, Verh. Bot. Zool. Ges. Wien, 189, 1853.

Guen. (in part), Phal., i, 345, 1857.

Walk. (in part), List Lep. Het. Br. Mus., xxii, 531, 1861.

Head rather wide in front, wider than in *Eucrostis*, not narrowing much in front. Palpi slenderer than in *Eucrostis*, a little upcurved, passing a little beyond the front. Male antennæ simple. Fore wings triangular; costa regularly arched; apex slightly produced, acute. Hind wings distinctly angled on the outer edge. In the venation, it only differs from *Eucrostis* in the subcostal cell being always closed. Hind legs long and slender; tarsi a little more than half as long as the tibiae; a single pair of tibial spurs. Abdomen long and slender, ending in a regular pencil of hairs. Coloration green.

This pretty genus differs from *Eucrostis*, with which some of the species have been confounded, by the angular hind wings and the simple antennæ. The species are of small size, delicate and graceful, and usually green, or green with an ochreous tinge and reddish fringe. The species fly in June in open fields near pine-woods.

Synopsis of the Species.

Yellow above and beneath.....*N. subcroceata*.
Dull sea-green; hind wings with line curved.....*N. gratata*.
Larger than *gratata*, with line on hind wing bent rectangularly.....*N. pistaciata*.

NEMORIA SUBCROCEATA Walker. Plate 10, fig. 78.

Nemoria subcroceata Walk., List Lep. Het. Br. Mus., xxvi, 1557, 1862.

Nemoria incrociata Walk., List Lep. Het. Br. Mus., xxvi, 1557, 1862.

5 ♂ and 1 ♀.—Shape of the wings as in *N. gratata*. Bright ochreous, including the body and wings, antennæ and legs. Head white on the

vertex, extending some distance on to the antennae; front deep dull red. On the wings is a common whitish line, situated nearer the middle of the wings than in the succeeding species; the line is nearly straight on the fore wings, much less oblique than in *gratata*, a little wavy; on the hind wings, the line is less curved than in *N. gratata* (it is sometimes obsolete). Beneath, both wings are uniformly deep orange-ochreous, with no markings. Fringe above and below concolorous with the wings.

Length of body, ♂, 0.34, ♀, 0.36; of fore wings, ♂, 0.40, ♀, 0.46; expanse of wings, 0.82–0.95 inch.

Milford, N. H. (C. P. Whitney, Mus. Bost. Soc. Nat. Hist.); West Roxbury, Mass. (Sanborn, Mus. Bost. Soc. Nat. Hist.); Albany, N. Y. (Lintner); Brooklyn, N. Y. (Graef).

This beautiful little species is of the same shape as in the more common dull-green *N. gratata*, but differs in the body and wings being usually of a uniform deep ochreous-orange tint above and beneath.

The specimen received from Mr. Lintner agrees with Walker's description of *N. incertata*. Both wings are above yellowish-green, and the fringe is slightly reddish, but the wings beneath are deep orange; it is thus, when seen above, apparently a variety of *gratata*, but beneath is unmistakably *suberocata*. Specimens may still be found to connect the two species. All three species are much alike, and the differences between them very slight.

NEMORIA GRATATA Walker, MS. Plate 10, fig. 79.

4 ♂ and 4 ♀.—Dull deep green, with a single faint, whitish, wavy line on the outer fourth of the wing, parallel with the outer edge of the wing. (This line is sometimes wanting, and there are no other markings on the wing in perfectly fresh specimens.) The fringe has a decided reddish tinge, or is concolorous with the wing. Beneath paler than above, with no markings. Both wings are of the same hue, and the fringe beneath is reddish. Prothorax deep rusty-ochreous. Head whitish-ochreous on the vertex, including the antennae; front deep rust-brown. Palpi and legs ochreous.

Length of body, ♂, 0.30, ♀, 0.32; of fore wings, ♂, 0.35, ♀, 0.35–0.40; expanse of wings, 0.80–0.85 inch.

Brunswick, Me., common in fields adjoining pine-woods, May 28 to June 10 (Packard); London, Canada (Saunders); Salem, Mass., June 17 (Cassino); Amherst, Mass. (Goodell); Boston, Mass. (Sanborn); Lansing,

Mich. (Cook); Albany, N. Y., May 30 (Meske); Philadelphia, Pa. (Amer. Ent. Soc.).

This species, common northward, may be known by the unusually deep dull-greenish tint; the common line, and only one present, is very faintly marked, sometimes entirely wanting. The fringe varies in being concolorous with the wing or tinged with reddish. There is sometimes a russet tint to the wings. It is smaller than *N. suberecta*, with a blunter apex to the fore wings and less angular hind wings.

NEMORIA PISTACIATA Guenée. Plate 10, fig. 80.

Nemoria? pistaciaria Guen., Phal., i, 348, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 534, 1861.

♂ ♀.—This is a larger species than *gratata*, with more produced acute fore wings and much more angular hind wings, as well as more distinct markings. Front edge of prothorax and palpi and legs deep ochreous. Front of head reddish. Wings deep sea-green, of the same tint as in *N. gratata*. Costa of fore wings tinged with reddish on the extreme edge (no inner line to be seen in my specimens). An outer line common to both wings, at about the same relative distance from the outer edge as in *gratata*; the line on the fore wings is a little sinuous, when a little effaced represented by venular dots; on the hind wings, the line is bent at nearly right angles following the outline of the outer edge. The fringe on both wings is rather long and unusually reddish (but in one case pale-green). Beneath, both wings are uniformly pale pea-green, with the costa of the fore wings distinctly yellowish; the fringe is reddish, as above. Both wings with very faint discal dark-green discolorations.

Length of body, ♀, 0.34; of fore wings, ♀, 0.46; expanse of wings, 0.90 inch.

Salem, Mass., June 8 (Cassino); Amherst, Mass., June 1 (Peabody); Brooklyn, N. Y. (Graef); Hastings on Hudson, N. Y. (Grote); Albany, N. Y., June 9 (Meske); West Farms, N. Y. (Angus).

This pretty species is larger, with more angular wings, than in *N. gratata*, and the costa of the fore wings is reddish above and yellow beneath, though the general tint of the wings is the same as in the two species. It agrees well with Guenée's description, except that there is in my examples no "external second line on the fore wings", as he states. His description is based on a single "♀ en mauvais état".

Desiderata

Nemoria? jascoloria Guen., Phal., i, 351, 1857. —“22^{mm}. Ailes supérieures d'un vert vif, parsemé d'une infinité de petite stries transversales, dues à l'interruption des écailles vertes, avec une seule ligne peu apparente, droite, formée aussi par l'interruption de ces écailles. Frange verte à extrémité blanche. Côte finement liserée de rose obscur. Ailes inférieures blanches et seulement teintées de vert au bord et à l'angle anal, sans dessin. Dessous des quatre ailes également vert, avec le bord interne blanc. Front, palpes et partie externe des pattes d'un rose sali.

“Californie. Une ♀. Coll. Bdv. •

“Appartient-elle bien au genre *Nemoria*? Il faudrait voir le mâle pour l'affirmer.”

Nemoria? indiscriminata Walk., List Lep. Het. Br. Mus., xxvi, 1556, 1862.—“*Female*. Pale yellowish-green, whitish beneath. Palpi obliquely ascending, bent; third joint linear, shorter and more slender than the second. Antennae stout. Wings transversely, minutely and indistinctly mottled with paler colour; interior and exterior lines paler, very indistinct. Fore wings hardly acute; costa straight; exterior border slightly convex. Length of the body 3 lines; of the wings 19 lines. East Florida.”

Nemoria? densaria Walk., List Lep. Het. Br. Mus., xxvi, 1557, 1862.—“*Male*. Very pale green. Head pale rosy in front. Palpi obliquely ascending, not rising higher than the vertex; third joint conical, very minute. Antennae moderately pectinated, except toward the tips. Legs smooth; hind tibiae with apical spurs only. Wings moderately broad, with a paler, straight, oblique exterior line; fringe long, full. Fore wings hardly acute; costa hardly convex; exterior border convex, moderately oblique. Length of the body 4 lines; of the wings 10 lines. East Florida.”

ANNEMORIA Packard. Plate 4, fig. 10.

Annemoria Pack., Proc. Ent. Soc. Nat. Hist., xvi, 39, 1871.

Allied to *Eucrostis*, but the head is much narrower in front, and not so broad on the vertex; in front, the sides are nearly parallel. Palpi about as long as in *Eucrostis*, but much stouter, slightly ascending; third joint distinct, thick, rounded. Antennae pectinated nearly to the ends, the branches short, those in the middle of the antennae about twice as long as the joints. Fore

wings shaped much as in *Eucrostis*, but rather more pointed at the apex; outer edge straighter; hind wings long, much more rounded, and not angulated, as in *Eucrostis*.

The costal space of the fore wings is very much narrower than in *Eucrostis*. Venation much as in *Chlorosea*, but the free end of the costal vein is thrown off from the outer end of the subcostal cell, and the origin of the sixth subcostal venule is rather remote from that of the anterior discal venule. Abdomen shaped much as in *Eucrostis*, being acutely pointed at the tip, which just reaches the anal angle of the hind wings. Hind tibiae swollen, with four stout acute spurs, while there are but two (terminal) in *Eucrostis* (male); a long large accessory tuft, as in *Eucrostis*. Hind tarsi slender, nearly two-thirds as long as the tibiae, while in *Eucrostis* they are half as long as the tibiae and stouter. The single species known is light green, with a single rather broad common line, not wavy and straight on the fore wings, curved on the hind wings. Differs from *Chlorosea* in the more rounded hind wings and in the venation.

ANNEMORIA UNITARIA Packard.

Annemoria unitaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 30, 1871.

1 ♂.—Palpi pink; front red; vertex white and antennae white above; abdomen white; thorax and wings deep pea-green, deeper than in *Eucrostis*. Extreme costal edge white. A single common white line crosses both wings; on the primaries it is straight, and situated just beyond the middle of the wing; on the hind wings it is well curved, and situated just beyond the middle of the wing. Fringe white, on the outer edge pinkish. Two anterior pairs of legs reddish.

Length of body, 0.45; of fore wing, 0.53; expanse of wings, 1.10 inches Nevada (Edwards).

The narrow, red front and the structure of the hind legs, the pinkish edge of the fringe, and its rather large size, are the distinguishing marks of this species.

CHLOROSEA* Packard. Plate 4, fig. 11.

Chlorosea Pack., Proc. Bost. Soc. Nat. Hist., xvi, 31, 1871.

Belonging apparently to the same group as *Nemoria* and *Annemoria*, and less closely to *Phorodesma*. Head with the vertex not so broad in proportion

(*Chlorosea*, green; ♂, ♂, moth.)

as in *Eucrostis* or *Pseudoterpna*; front moderately broad, less so, however, than in *Eucrostis*. Palpi rather long and slender, projecting farther than usual beyond the front (though not nearly so much so as in *Synchlora*), slightly ascending; third joint small, but distinct. Antennæ pectinated almost to the tip; branches about half as long in proportion as in *Eucrostis*, or longer than in any other genus except *Eucrostis*; in the female, slender and filiform. Fore wings shaped much as in *Eucrostis*, costa curved in the same manner; apex subacute, outer edge curved in much the same way. The costal space is slightly narrower in proportion than in *Eucrostis*, and the fifth subcostal or subapical space is small, being one-fourth as long as the wing, while in *Eucrostis* it is much larger, being one-third as long as the costa of the wing. Hind wings of much the same shape as in *Phorodesma* and *Pseudoterpna*, not being produced and subangulated as in *Eucrostis*, or so long and fully rounded as in *Eumecoria*; the apical region is full and rounded, while the outer edge is very straight. The venation is much as in *Annemoria*, the posterior discal venule being greatly curved; the sixth subcostal venule co-originate with the anterior discal venule. The costal vein, after anastomosing with the subcostal, is thrown off near the base of the subcostal cell. The abdomen does not reach the anal angle of the hind wings; its shape is much as in *Eucrostis*. Hind legs unusually small; tibiae very slender and short, shorter than the tarsi, and with but a single terminal pair of spurs in both sexes. No essential difference between the sexes, except in the antennæ.

Coloration pale green, with a single oblique white line on the fore wings; hind wings immaculate. The known species are of larger size than usual in the allied genera.

While the palpi are less ascending than in *Eucrostis*, the antennæ are one-half as widely pectinated, but wider than in *Eumecoria*, or, in fact, any genus of the subfamily except *Eucrostis*. The hind legs are much as in *Phorodesma*, but there is but one pair of spurs, and the vertex is not so broad as in that genus, while the antennæ are pectinated near the tip. The hind wings are more produced toward the apex than in *Annemoria*.

Synopsis of the Species.

Of large size, with male antennæ narrowly pectinated..... *C. nevadaria*.
 Like *nevadaria*, but fore wings sharper; outer edge more oblique..... *C. bistriaria*.
 Small; male with very broadly-pectinated antennæ..... *C. parvibasiaria*.

CHLOROSEA NEVADARIA Packard. Plate 10, fig. 81.

Chlorosea nevadaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 31, 1874.

2 ♂ and 5 ♀.—Pale pea-green. Head whitish at the insertion of the antennae (which are white above), but greenish on the hinder edge of vertex; front pale greenish, pink on the orbits, or entirely pink. Palpi whitish; thorax green. Both wings pale green, coarsely and diffusely strigated with white. Fore wings whitish on extreme edge of costa; an oblique, rather broad band, straight in its course, crosses the wing from just beyond the middle of the inner edge to the outer fifth of the costa; it is situated nearer the outer edge in the female. No other markings. Hind wings slightly paler than the primaries, with a white line just beyond the middle, broader and less distinct than on the fore wings. Beneath, uniformly pale green; hind wings a little paler than primaries; faint traces of the line on the fore wings. Legs whitish; two anterior pairs of tibiae pink. Abdomen white, tinged with pinkish at the base, with two conspicuous round spots, having an irregular v-shaped pink spot between them, and another behind.

Length of body, ♂, 0.55, ♀, 0.45–0.50; fore wing, ♂, 0.70, ♀, 0.60–0.68; expanse of wings, 1.45 inches.

Nevada (Edwards); Victoria, Vancouver Island (Crotch, Mus. Comp. Zoöl.); Southern California (U. S. Dept. Agriculture); Sanzalito, Cal., June 2–7 (Behrens).

The species may be recognized by its large size, the single line common to both wings, by the white and pink spotted abdomen, and by the very slender hind legs with the single pair of tibial spurs.

CHLOROSEA BISTRIARIA, *sp. nov.* Plate 13, fig. 55.

1 ♂.—This fine species is intermediate between *C. nevadaria* and *periviridaria*. It is of the same size as *nevadaria*, but the fore wings are more produced toward the apex, the outer edge being more oblique; the antennae are much more heavily pectinated, while the palpi are considerably stouter. From *C. periviridaria* it differs in being much larger, the antennae are a little more heavily pectinated, while the palpi are stouter; the wings are also a little more produced toward the apex, the outer edge being much more oblique. Body and wings pea-green. Head in front roseate. Fore wings with two heavy, broad, distinct, parallel, white lines; the inner line arises in

the middle of the costa and ends on the inner third of the inner edge of the wing: the outer line is nearly parallel with the outer edge of the wing, but is still more oblique, ending a little inside of the outer third of the inner edge. Hind wings of the same form as in *C. percellularis*: white on the inner two-thirds. Beneath, greenish, with an extradiscal broad band on both wings: that on the hinder pair being much broader than that on the fore wings.

Length of body, ♂, 0.90; of fore wing, ♂, 0.68; expanse of wings, 1.40 inches.

Nevada (H. Edwards).

CHLOROSEA PERVIRIDARIA, *sp. nov.* Plate 10, fig. 82.

2 ♂.—Of the same form as in *C. nevadaria*, with longer pectinations to the antennæ. Front reddish-brown: vertex and antennæ reddish. Palpi rather brighter reddish than the front of the head. Head beneath, thorax, and wings bright pea-green. Fore wings uniformly bright pea-green, with no markings except a single, narrow, oblique, firm, white line, which runs from a little beyond the middle of the inner edge to the outer fifth of the costa: costal edge reddish (hind wings greenish, like the fore wings). Beneath, both wings of the same hue as above, hinder pair uniformly greenish: a faint trace of the oblique line on the fore wings. Legs greenish: anterior and middle tibiae deep red internally, white externally: all the tarsi whitish. Abdomen whitish, with some green scales.

Length of body, ♂, 0.35; of fore wings, ♀, 0.50; expanse of wings, 1.00 inch.

Sanzalito, Cal., June 27 to July 10 (Behrens).

This pretty species differs from *C. nevadaria* in its much smaller size, more broadly-pectinated antennæ, reddish costa, and brown front.

SYNCHLORA Guenée. Plate 4, figs. 9, 12.

Synchlora Guen., Phal., i, 375, 1857.

Eumomoria Pack., Fifth Ann. Rep. Peab. Acad. Sci., 56, 1873.

♂.—Allied more closely to *Rachospila* than any other genus of this group. The front is unusually broad and square, much more so than in *Aplodes*. Male palpi short, small, and weak, not extending beyond the front: tip subacute, hairy: terminal joint short, pointed, partially concealed in the

hairs of the second; in the female, remarkably long and slender, extending far beyond the head; third joint long and slender, one-half as long as the second joint. Antennae short, just half as long as the fore wings, stout, thick at base, well pectinated on the basal two-thirds, terminal third simple. Wings of much the same shape as in *Aplodes*, but the outer side is more oblique. The hind wings are of the same shape as in *Aplodes*; not angulated mesially, but well rounded on the outer edge. All the venules are shorter than in *Aplodes*, originating farther out toward the outer edge of the wing. The subcostal venules much shorter than in *Aplodes*, and the posterior discal venule much less bent. The body is short and stout, and the abdomen is not ornamented with pale pustules or reddish scales, but with a dorsal white line. The front is more like *Nemoria* than *Aplodes*. Hind legs as in *Aplodes*.

The species of this genus may be known by the broad front of the head (not square, as in *Aplodes*), by the straight costa of the fore wings, and the rounded outer edge of the hind wings. The antennae are more broadly pectinated than in *Aplodes*. The palpi differ greatly in the two sexes, so that I was misled into separating the males, and regarding them as types of a distinct genus (*Eunemoria*). The female palpi are of great length, and are much as in *Racheospila*.

Larva.—Body cylindrical, ornamented with large conical or flap-like dorsal tubercles. Plate 13, fig. 23, is probably the larva of *Synchlora excurraria*. The moth, copied from Abbot's MS. drawing, is represented by fig. 41, and agrees well with *excurraria*, but may prove to be distinct. The caterpillar is rather thick-bodied, with ten very large dorsal tubercles, which are brown, tipped with yellow. The body is yellowish, thickly spotted and slashed with brown. It bears a close resemblance in color to the brown center of the flower of *Rudbeckia nitida*, the food-plant. The pupa is moderately thick and brown.

The larva (plate 13, fig. 34) of another *Synchlora* (fig. 46) allied to *excurraria*, but with the fringe of the wings red, is represented by Abbot in a MS. drawing as quite slender and cylindrical, green, with a reddish head, and seven pairs of slender, red, conical tubercles, the sixth pair situated a little behind the middle of the body, and the seventh forming the terminal pair. The chrysalis is reddish-green and very slender. The food-plant is *Baccharis halimifolia*.

Synopsis of the Species.

Costa of wings reddish	<i>S. tricoloraria</i> .
Front green, lines much excurved, and scallops large ..	<i>S. excurvaria</i> .
Front green; scallops slightly marked; outer line slightly sinuous ..	<i>S. californaria</i> .
Female like female of <i>rubroraria</i> , but with the front reddish	<i>S. californaria</i> .

SYNCHLORA TRICOLORARIA Packard. Plate 10, fig. 83.

Eumomoria tricoloraria Pack., Proc. Ent. Soc. Nat. Hist., xvi, 39, 1874.

1 ♂ and 1 ♀.—Antennae well pectinated, white above; palpi stout, red, white along the lower edge; wings much as in the eastern species, *S. rubroraria*. Front duller red than palpi; vertex white, with a few reddish scales at base. Body and wings pea-green. Fore wings green; costa white, tinged with red at the base. Two curved, much wrinkled, white lines nearer together and more waved than usual, cross each wing. Fringe green, whitish at insertion and at the outer edge. Fore and middle tibiae and tarsi reddish. Beneath, fore wings pale, deeper green on the costal half; basal two-thirds of costa deep red. Hind wings whitish-green. The outer line on fore wings faintly re-appears. Abdomen wanting.

Length of fore wing, ♂, 0.40, ♀, 0.50; expanse of wings, 0.85–1.00 inch. California (Edwards); Sanzalito, Cal. (Behrens).

The female is much larger than the male, and has very long pink palpi. This species differs from all the Atlantic States species in the costa of the fore wings being reddish.

SYNCHLORA EXCURVARIA Packard. Plate 10, fig. 85.

Synchlora excurvaria Pack., Fifth Rep. Peab. Acad. Sc., 76, 1873.

1 ♂ and 3 ♀.—Of the usual form. Front green. Palpi green, tipped with pale brown or reddish. Fore wings whitish on the costa, the two lines much as usual and at the usual distance apart; inner line sinuate; outer line on both wings much more irregular and wavy than usual, approaching the outer edge more on the median venules. The usual white line on the abdomen. Beneath whitish, greenish on costal half of fore wing; two anterior pairs of legs greenish at base; fore tibiae washed with pale brown.

Length of body, ♂, 0.30, ♀, 0.30; fore wing, ♂, 0.32, ♀, 0.40; expanse of wings, 0.65–0.90 inch.

Demopolis, Ala. (Groter); Dallas, Texas, October 4 (Bell, Mus. Peab. Acad. Sc.); Waco, Tex., October 10 (Beltrage).

This species differs from the others by the outer line being much more

scalloped and curved outward near the outer edge of the wing, making a bold and sudden curve on both wings; the inner line common to both wings with much larger scallops than in any of the other species known to me.

SYNCHLORA RUBIVORARIA Packard. Plate 10, fig. 86.

Adolodes rubicora Riley !, First Ann. Rep. Ins. Missouri, 139, plate 2, fig. 25, 1869.

Synchlora albolineata Pack., Fifth Ann. Rep. Peab. Acad. Sci., 75, 1873.

Euemoria gracilaria Pack., Fifth Rep. Peab. Acad. Sci., 77, 1873.

10 ♂ and 6 ♀.—Pea-green; a white stripe between the antennae, which are also white, and beneath pale testaceous; palpi and legs white; front and pectus green; a green stripe on the fore trochanters. Palpi very long, extending out nearly twice the length of the head, greenish or reddish at tip. Fore wings with the costal edge white; a basal curved line, slightly dentate on the venules. Discal dot very linear, pale, obscure. Outer white line parallel with the outer edge, dentate on the venules. Edge with white dots on the venules. Fringe pale green. Secondaries with a much curved basal white line, a linear, small, white, discal dot; outer line very dentate on the venules, much more so than the same line on fore wings. Fringe pale; edge with white dots on ends of venules. Beneath, fore wings testaceous, whitish on costal edge; fringe white; anterior half of wings greenish, posterior whitish. Secondaries whitish; the line appears, though very faintly. Abdomen green, streaked mesially with white.

Length of body, ♂, 0.33, ♀, 0.43; length of fore wing, ♂, 0.36, ♀, 0.54; expansion of wings, 0.65–1.08 inches.

Maine (Packard); Boston, Mass. (Sanborn); Natick, Mass. (Stratton); "Mass., Aug. 5" (Harris Coll. Bost. Soc. Nat. Hist.); Springfield, Mass., July 19 (Dimmock); Dorchester, Mass. (Sanborn); Amherst, Mass., September; Brooklyn, N. Y. (Graef); Long Island (Morrison); West Farms, N. Y. (Angus); New Jersey (Sachs); Central Missouri, September (Riley); Lawrence, Kans. (Snow); Demopolis, Ala. (Grote); Dallas, Tex., June 16 (Boll, Mus. Peab. Acad. Sci.).

This common species may be recognized by the uniformly green front of the head; otherwise it very closely resembles *S. rubrifrontaria*. It varies greatly, as do all the species in size. It also varies somewhat in the distance between the two common lines, and in the degree of sinuosity and scalloping of the lines.

Larva.—"Color light yellowish-gray, darker just behind each joint, and

very minutely shagreened all over. On each segment, a prominent, pointed, straight projection on each side of the dorsum, and several minor warts and prickles below. Two very slightly raised, longitudinal, lighter lines along the dorsum, between the prominent prickles. Ten legs. Average length, 0.80 inch. It has the peculiar faculty of thoroughly disguising itself with pieces of dried berry, seed, pollen, and other *debris* of the fruit, which it sticks to a series of prickles with which it is furnished. Add to this disguise the habit which it has of looping itself into a small ball, and it almost defies detection. It is most numerous (in Illinois) during the months of June and July, the moth appearing July 9. It feeds upon the fruit of the raspberry."—Riley.

SYNCHLORA RUBRIFRONTARIA Packard.

Synchlora rubrigranaria Pack., Fifth Rep. Peab. Acad. Sci., 55, 1873.

♂ and ♀.—Closely resembling *S. rubivoraria*, but differing in the front and palpi being reddish, as also the fore tibiae; the fore wings are a little more prolonged toward the apex, but the markings and coloration of the wings and body are almost identical, except that the basal line on the hind wings is much less curved than in the other species, and the lines generally are a little less curved, but about the same distance apart.

Length of body, ♂ 0.35–0.38; length of fore wing, ♂ 0.43–0.50; expanse of wings, 0.85–1.05 inches.

West Farms, N. Y. (Angus); Brooklyn, N. Y. (Graef); Central Missouri, August (Riley).

This species differs from the more abundant *S. rubivoraria* in the front of the head being reddish and the lines more distinctly scalloped and inclined to be heavier.

Desideratum.

Synchlora liquoraria Guen., Phal., i, 375, 1857.—"23^{me}. Ailes d'un vert pomme, à frange concolore à la base, blanchâtre à l'extrémité, précédée seulement de petits points blanc placés au bout des nervures. Les deux lignes communes, blanches, bien nettes, la première ondulée, la seconde dentée. Un trait cellulaire peu visible. Supérieures avec la côte blanche, lisérée intérieurement de rose carné. Dessous d'un blanc-verdâtre. Les supérieures plus vertes, avec la côte plus largement rose qu'en dessus. Front d'un carné obscur. Palpes blancs, teints de rose. Abdomen blanc, à dos vert, divisé par une ligne médiane blanche.

"Californie. Une ♂. Coll. Bdy."

RACHEOSPILA Guenée.

Racheospila Guen., Phal., i, 372, 1857.

Walk., Lep. Het. Br. Mus., xxii, 581, 1861.

"Antennes des ♂ pectinées, à sommet filiformes. Palpes à dernier article linéaire, plus ou moins long. Corps assez robuste; l'abdomen muni de petites crêtes redressées ou orné de taches blanches, cerclées de rouge obscur, conique chez les ♂, ovoïdes, épais chez les ♀. Pattes grêles, assez longues, sans aigrettes; les tibias postérieurs à deux paires d'éperons. Ailes entières, à frange lisérée ou entre coupée de rouge; les inférieures avec un coude peu senti ou milieu."

From the want of any male in this genus, I am obliged to copy Guenée's description. Comparing my single female of *R. sitellaria* Guen., from Porto Rico, I am unable to find any good structural characters to separate it from females of *Synchlora*. In the style of coloration, it differs decidedly, having a well-marked brown discal dot on each wing, and a dorsal row of raised abdominal white round spots surrounded with red. The usual white lines are represented by rows of isolated white dots. The hind wings are, perhaps, a little less convex on the outer edge than in *Synchlora*. The female palpi are as in *Synchlora*. Until our native species is discovered in both sexes, the generic characters must remain as quoted from M. Guenée. In venation, *R. sitellaria* differs from *Synchlora* chiefly in the posterior discal venule being bent in the middle rather than near the origin, as usual; otherwise the venation is much as in *Synchlora*.

RACHEOSPILA LIXARIA Guenée.

Racheospila lixaria Guen., Phal., i, 374.

Walk., List Lep. Het. Br. Mus., xxii, 581, 1861.

"26^{mm}. Ailes d'un beau vert-d'eau, avec un lisérée rouge fin, très-net, interrompu par des points blancs vis-à-vis des traits rouges qui entre coupent la frange. Une ligne commune, très-fine, dentée, d'un blanc-verdâtre, traverse le milieu des ailes qui ont, en outre, chacune un tres-petit point cellulaire brun. Les supérieures ont la côte lisérée de blanc. Dessous d'un blanc-verdâtre pâle, avec le lisérée très-distinct. Front rouge. Abdomen avec de grandes taches blanches lisérées de rouge. Amérique septentrionale. Un ♂. Coll. Guen."

APLODES Guenée — Plate 4, figs. 13, 13*a*.

Aplodes Guen., Phal., i, 376, 1857.

and *Iodes* Walk. (in part), East Lep. Hist. Br. Mus., xxii, 549, 1851, 1861.

Hyparrhichius Walsh, Proc. Bost. Soc. Nat. Hist., ix, 309, 1864.

Head nearly square in front. Palpi slightly ascending, rather slender, reaching a little in front of the head; third joint short, conical. Antennae of male with short, slender pectinations. Fore wings with the costa rather fall; apex subacute. Hind wings usually distinctly angled in the middle. Venation: a subcostal cell closed or open; the costal vein touches the middle of the subcostal cell, the posterior discal venule and the first two median venules either co-originating or the origin of the first median remote from that of the second. Hind legs of the male: tibiae rather long, four equal spurs, with a pointed projection extending beyond the spines; tarsi short, very slender, but little more than half as long as the tibiae. Abdomen long and slender, greenish above and spotted with white, or with a long, white, dorsal band. Wings with two common, white, narrow lines, the outer line on the hind wings usually distinctly bent.

The green or whitish abdomen, with the conspicuous white or reddish spots, and the angled hind wings, distinguish the species of this genus from *Rachispila*, in which the species are smaller, with very long palpi, the third joint being of great length, while the spots on the abdomen are white surrounded with red.

Larva.—“Ten-footed, its dorsum with curved lateral appendages covered with short, velvety hair, and similar to those of *Limacodes? hyalinus* Walsh, except that they are much shorter and none of them abruptly longer than the others.”—(Walsh.) The pupa is greenish or brownish, enclosed in a slight cocoon among leaves, fastened together with a few silk threads.—(Scudder.)

Synopsis of the Species.

A. Origin of first median venule remote from that of the second:

hind wings scarcely bent; abdomen spotted with red:

Green, with a brown line behind the antennae; fringe reddish on the outer two-thirds.....*A. rubrofasciata*.

B. First and second median and posterior discal venules co-originating; hind wings angled:

a. *Species brown*:

Brown, with a marginal, darker, interrupted line.....*A. brownaria*.

b. Species green:

Larger than the succeeding species; hind wings bent; three conspicuous abdominal spots.....*A. mimosaria*.

Like *A. rubrifrontaria*, but with the lines broader than usual.....*A. rubromarginaria*.

A fine, interrupted, reddish line at base of fringe.....*A. rubrolinearia*.

The two lines on fore wings very wide apart; fringe white.....*A. latiaia*.

The two lines approximate; fringe green.....*A. approximaria*.

APLODES RUBRIFRONTALIA Packard. Plate 10, fig. 87.

Rachospila rubrifrontaria Pack., Fifth Rep. Peab. Acad. Sci., 76, 1873.

2 ♂ and 3 ♀.—Front pale ochreous-brown; front edge and clypeus pale, concolorous, slightly roscate at tip; vertex white between the antennæ, margined behind with reddish. Antennæ pale testaceous, whitish above. Wings pea-green, as usual; costal edge of primaries whitish; an inner, slightly curved, irregularly-undulating line; an outer, more distinct, straight line, a little waved just before the costa, where it becomes obsolete; outer half of fringe rosaceous; fringe rosy on tip of the fore wings. On the secondaries but one line, bent a good deal in the middle. Beneath, paler, the lines appearing faintly through. Thorax green, a white (sometimes red) blister at base of abdomen; on third and fourth abdominal rings a white spot, margined irregularly with dull ochreous or entirely reddish; beyond white. Legs concolorous with the front.

Length of body, ♂, 0.40, ♀, 0.40; of fore wing, ♂, 0.53, ♀, 0.60; expanse of wings, 1.10–1.25 inches.

Brunswick, Me., June 6, in open fields near pine-woods (Packard); Massachusetts (Sanborn); Chicago, Ill. (Wescott); Victoria, Vancouver Island, July (Crotch); Sierra Nevada (Crotch, Mus. Comp. Zool.).

The ochreous-brown front, legs, and palpi tipped with rosaceous, the abdomen green at base, with the conspicuous blister, white in the male and red in the female, and the two succeeding dull reddish spots, and the red spot on the fringe at the apex of the fore wings, will distinguish this not uncommon species.

I am unable to detect any differences between the Pacific and Atlantic coast individuals in the markings or colors. The female from Sierra Nevada is slightly larger than the female from Chicago, the fore wing of the former measuring 0.63 and that of the latter 0.60 inch. In a specimen from Texas, there are four discal spots; in other respects, it does not seem to differ from northern specimens.

Larva and pupa.—The following description of the larva and pupa is copied from Mr. Scudder's notes: "Light grass-green. The shape of the larva is quite peculiar. The head is quite small and may be partially withdrawn within the prothoracic segment, the thoracic segments are also rather small; the remaining segments are nearly equal, but each segment bears a peculiar elongation at the lateral line, those of the segment bearing the ventral proleg, and the one posterior to it being much smaller than the rest, becoming merely a horizontal wart, while on the others they become compressed appendages turned outwards and upwards, inclined considerably forwards and armed at the tip with two elliptical warts, terminated with a bristle, the anterior one pointing in the general direction of the appendage, the posterior directed backward: these appendages are reddish towards the end and increase in size posteriorly, attaining their maximum size on the sixth segment and then decreasing to the ninth. The eleventh segment bears subdorsal horns long, conical, straight and spiny, each surmounted by a bristle-bearing wart, like that on each of the lobes of the appendages mentioned. The prothoracic segment also bears anteriorly a transverse row of four short horns similar to those on the eleventh segment, and posteriorly two situated behind the central two of the anterior row: each of these bears two bristles. On all the other segments there are two pairs of subdorsal minute bristle-bearing warts. The entire body, legs, head and horns are covered with minute short white blunt spines. The head is rather deeply cleft, whitish, granulated, with some dark spots: labrum edged with reddish: antennae pale. The body is slightly paler beneath, with a pale stigmatal band on the abdominal segment turning upward at the fourth and fifth segments. Length 0.70 inch, breadth $\frac{1}{15}$ inch. It was found at Princeton, Mass., Aug. 24, feeding on *Comptonia asplenifolia*. On the fourth of September it began to make a cocoon by fastening together pieces of leaves and the ends of whole leaves, with a few silk threads.

"Pupa grass green, dotted profusely with dark green; the top of the head and thorax and all of the abdomen is of a dirty white color, dotted rather profusely with brownish; the last segment is hoof-shaped and yellowish, with two reddish hooks. An indistinct dark stigmatal band. Spiracles brownish encircled with dirty white. A black dorsal band runs the whole length of the body. Length 0.44 inch." A chrysalis was also found at Framingham, Mass., August 2.

APLODES BRUNNEARIA, *sp. nov.* Plate 10, fig. 88.

2 ♂.—Of the size of *A. mimosaria*, but with the wings slightly more bent, particularly the hinder pair, and the apex of the fore wings more obtuse. Body and wings light brown. Head white on the vertex; in front, brown, like the rest of the body. The white bands are arranged much as in *A. mimosaria*, there being two white lines common to both wings, the inner way and fading away near the costa, the outer being slightly oblique and a little wavy. On the hind wings, the outer line is a little broader than in *mimosaria*, but bent in the middle at the same angle; a narrow, marginal, dark-brown line, interrupted by the venules; fringe long and silky. Beneath, paler than above, with a very faint ochreous tinge on the costa; the lines are faintly reproduced.

Length of body, ♀, 0.32–0.43; of fore wing, ♀, 0.43–0.53; expanse of wings, 1.00 inch.

West Virginia, April 18 (T. L. Mead); Central Missouri, May 7 (Riley); Dallas, Texas (Boll, Mus. Peab. Acad. Sc.).

This differs from all the other species of this genus in being pale brown, and is a remarkable exception to the prevalent mode of coloration in the *Geometrine*. It differs from *A. mimosaria* in the blunter apex of the fore wings, the broader lines, and the presence of a dark, marginal, interrupted line.

Larva.—Body short and thick, with two small tubercles on the thoracic segments; four large triangular flaps on the median rings, and one on the end of the body. Pale brown, slashed with a darker tint. Pupa slender, pale brown. Food-plant *Juglans nigra* (described from Abbot's MS. drawings). This is certainly the larva of *brunnearia*; but since the male is represented by Abbot as green, and scarcely distinguishable from *A. rubrifrontaria*, it may prove to be the same larva as that described by Mr. Sender, and *brunnearia* may prove to be the female of this or a closely-allied species, though what I have described as the females of *rubrifrontaria* seem to be such. Fig. 47, plate 13, represents the male of Abbot's drawing.

APLODES MIMOSARIA Guenée. Plate 10, fig. 89.

Aploides mimosaria Guenée!, *Phal.*, i, 377, 1857.

Walk., *List Lep. Het. Br. Mus.*, xxii, 586, 1861.

Ides tractaria Walk.!!! (*vide* Grote), *List Lep. Het. Br. Mus.*, xxii, 540, 1861.

Hyparchestus renustus Walsh! (*vide* Riley) *Proc. Ent. Soc. Nat. Hist.*, ix, 301, 1864.

1 ♂ and ♀.—A rather large species, with the antennæ moderately well

pectinated. Apex of fore wings square, outer edge not very convex. Hind wings well rounded, less angulated than usual; anal angle square. Body and wings of the usual pale-green color; head and antennae white, front bright rose-colored, except on front border. Palpi white; end of second joint and under side of third joint rescate. Both pairs of wings crossed by linear, slightly-waved, white lines. Inner line on fore wing, very near the base of wing, regularly curved; outer line straight, waved, parallel with outer edge. Costa narrowly edged with white. Fringe white on both wings. Hind wings with the inner line nearer the base of wing than on fore wings, curved regularly. Outer line bent outward in the middle, the line not so wavy as on fore wing. Beneath, both lines faintly reproduced (not "*avec une seule ligne blanche*", as Guenée says). Hind wings and posterior two-thirds of fore wings whitish-green. Outer side of fore femora green, of tibiae dull red; two posterior pairs white. Abdomen white, green at base above, with a conspicuous white spot at base.

Length of body, ♂, 0.45, ♀, 0.40; of fore wing, ♂, 0.60, ♀, 0.56 inch.

Roxbury, Mass., June (C. S. Minot); Dedham, Mass. (F. W. Very); Berkshire County, Mass., July 7 (Shurtleff); Albany, N. Y., June 9 (Lintner); Brooklyn, N. Y. (Graef); Philadelphia, Pa. (Amer. Ent. Soc.); Easton, Pa. (Stultz); Saint Louis, Mo., May 5 (Riley); Rock Island, Ill. (Walsh); "Trenton Falls, N. Y.; Orilla, West Canada; Nova Scotia" (Walker).

Larva and pupa.—The following description is taken from Mr. Walsh's account of this insect. "Larva ten-footed, cylindrical, its dorsum with curved lateral appendages covered with short, velvety hairs, and similar to those of *Limacodes? hyalinus* Walsh, except that they are much shorter and none of them abruptly longer than the others. Of a dingy brown color, and including the appendages about one-fourth of an inch in diameter.

"The pupa is of a pale ochreous brown color, varied with reddish-brown, with many fuscous dots, especially along the nervures of the wing-cases, and with the caudal spine simple. It measures 0.43 inch, including the spine." It feeds on the oak.

APLODES RUBROMARGINARIA, *sp. nov.* Plate 13, fig. 41.

1 ♀.—This is rather smaller than any of the other species, but the wings are of the same shape; the apex of the fore wings is a little more rounded than in *A. rubritroutaria*, which it approaches in most respects nearer

than any other species. Vertex of the head, and antennae white; front reddish, with a faint white line at base and in front. Palpi reddish, extreme tip white. Body and wings of the usual pea-green tint. Fore wings with the usual two white lines, but wider than in any other species of the genus, particularly the outer line, which otherwise is situated much as in *A. rubrifrontaria*. The line on the hind wings is but slightly bent, much less so than in *A. rubrifrontaria*. The fringe is reddish, with a deep-red line at the base. Body beneath and legs white (the abdomen above is too much rubbed for description). Beneath, pale greenish, with the common white line faintly reproduced.

Length of body, ♀, 0.35; of fore wing, ♀, 0.45; expanse of wings, 0.90 inch.

Montreal, Canada (Caulfield).

APLODES RUBROLINEARIA Packard. Plate 10, fig. 90.

Aplodes rubrolinaria Pack., Fifth Rep. Peab. Acad. Sc., 74, 1873.

1 ♂.—Structurally very near *A. mimosaria*, but differs from it and the other two species in the peculiar glossy silken luster of the wings. Antennae and palpi as in *A. mimosaria*; palpi reddish on the two terminal joints; front reddish. Wings not so deep green as in *A. mimosaria*. Fore wings white on the costa as usual; inner line situated the same distance from the base of wing as in *mimosaria*, wavy, angulated distinctly outward on the median vein. Outer remote from inner line, a little wavy, and a little narrower than usual. Secondaries with the two lines well marked, remote inner one distinct, very near base of wing, curved and waved; outer line slightly wavy, curved outward more than usual in the middle of the wing. Fringe of a peculiar pale silken-green luster, with a faint narrow red line at base (this line easily overlooked). Abdomen with a white spot at base, and with two white distinct bands on two following segments; terminal third white. Fore legs whitish-brown, ringed with white; two hinder pairs white. Wings beneath whitish-green; costa of fore wings white. The outer line faintly reproduced on the fore wings.

Length of body, 0.41; fore wing, 0.46; expanse of wings, 0.95 inch.

Philadelphia, Pa. (Coll. Amer. Ent. Soc.).

This species may at once be identified by the faint, linear, reddish line at base of fringe.

APLODES LATIARIA Packard. Plate 10, fig. 91.

Aplodes latiaria Pack., Fifth Rep. Peab. Acad. Sc., 74, 1-74.

1 ♂.—Pale pea-green. Front reddish above, below white; palpi reddish on the outer half; antennae pectinated as usual. Wings of the usual form; fore wings white on the costa; the two lines remote; the inner very near the base of wing, a little curved and slightly waved. Outer line rather broader than usual, at the same distance from outer edge as usual, slightly bent before reaching the costa. Hind wings with no basal line; the outer line rather broad, bent in the middle, not rounded, as in the two other species of its size, but much as in *A. mimosaria*. Fringe whitish, nearly concolorous with the lines. Abdomen with a round white spot at base. Beneath whitish, green on costal half of fore wings, with the line faintly reproduced.

Length of body, 0.42; fore wing, 0.50; expanse of wings, 1.05 inches. Albany, N. Y. (Lintner).

This delicate species may be known by the front being half red and half white, by the outer line being rather broader and the two lines on fore wings rather farther apart than usual; also by the single line on the hind wings being angulated, not curved in the middle. In this respect, it differs from the two other species of its size, *A. rubrolinearia* and *A. approximaria*.

APLODES APPROXIMARIA Packard. Plate 10, fig. 92.

Aplodes approximaria Pack., Fifth Rep. Peab. Acad. Sc., 73, 1-73.

1 ♀.—Wings much as usual, though the fore wings are broader and the hind wings more rounded and less angulated than in the female of *A. mimosaria*. Front and outer half of palpi reddish-brown. Fore wings white on the costa, as usual; the two white lines much nearer together than in any other species, the inner line being remote from the base, ending nearly in the middle of the hind edge; it is scarcely curved, and with a slight angle on the median vein; outer line farther from the edge than usual, not waved, bent slightly before reaching the costa. Hind wings with inner line almost obsolete; outer line much nearer middle of wing than usual, curved, not bent so much as in the other three species known to me. Fringe green, nearly concolorous with the body. Beneath, both wings greener than in any of the other species, with faint traces of the outer line on the fore wings. Two anterior pairs of legs, bathed in pale brown. Abdomen greenish on basal half, with a dorsal pale line.

Length of body, 0.40; of fore wings, 0.53; expanse of wings 1.06 inches.

Albany, June 9 (Lintner).

This pretty green species differs from the others of its size in its red front, leaving but a narrow, white, anterior margin, its brown legs, the close approximation of the two lines on the fore wings, and in the slightly bent and curved line on the hind wings; also by the greenish fringe, and by both wings being greener than usual beneath.

Desideratum.

Aplodes glaucaria Guen., Phal., i, 377, 1857.—“18^{mm}. Ailes supérieures à bord presque droit, inférieures arrondies; les quatre d'un vert clair, avec deux fines lignes blanches, écartées, presque dentées; la première comme chez *mimosaria*; la seconde sinuée aux supérieures, arquée et coudée aux inférieures; côte des supérieures blanche. Dessous d'un blanc-verdâtre, sans dessin. Front vert, avec le vertex blanc. Pattes blanches, avec la partie interne des tibias antérieurs un peu rosée. Base de l'abdomen verte, tachée de blanc.

“Géorgie américaine. Deux ♂. Coll. Mus. et Lefebvre.”

ANAPLODES, *gen. nov.*

Male.—Head rather broad, wider than in *Aplodes*. Palpi a little longer than in *Aplodes*, but much shorter than in *Racheospila*, porrect, extending well in front of the head. Antennæ pectinated much as in *Aplodes*. Fore wings of much the same form as in *Aplodes*, but with the outer edge less oblique. Hind wings much as in *Aplodes*, but with no bend in the outer edge. Hind legs long and slender; the hind tibiae not swollen; the tarsi long and slender, two-thirds as long as the tibiae. Abdomen long and slender, as in *Aplodes*, but with no pink spots.

This genus only seems to differ from *Aplodes* in the broader front, the less oblique outer edge of the fore wings, and the slender, unswollen hind tibiae, those of *Aplodes* being somewhat swollen, and the tarsi being only one-half as long as the tibiae.

ANAPLODES PISTACIARIA, *sp. nov.* Plate 13, fig. 58.

2 ♂.—Body and wings of the usual pea-green color. Head white on the vertex; in front deep red; palpi deep red. Fore legs in front deep red;

hind tibiae pink externally. Both wings uniformly streaked with white. A single white extradiscal line, common to both wings; on the fore wing the line straight, ending at the same distance on the costa from the apex as on the inner edge from the inner angle. On the hinder pair, the line is situated on the middle of the wing. Discal dots on both wings brown. Abdomen green, whitish on the edges and sides of the segments. Costa of fore wings whitish, tinged immediately on the edge with brown; beneath, deep brick-red on the basal half. Discal dots beneath on both wings; the common line obsolete.

Length of body, \mathcal{L} , 0.45; fore wing, \mathcal{L} , 0.55; expanse of wings, 1.10 inches.

Sauzalito, California, June 30 (Behrens).

GEOMETRA Linnaeus (emend.). Plate 4, fig. 14.

Geometra Linn. (in part).

"*Hipparchus* Leach, Edm. Encey. ix, 134, 1815."

Eutichoris Hübn., Verz., 283, 1818.

Holothalassus Hübn., Verz., 285, 1818.

Geometra Treits., Schm. Eur., v, 139, 1825.

Dup., Lep. France, viii (iv), 106, 1829.

Hipparchus Steph., Nomencl. Br. Ins., 13, 1829.

Geometra Boisdu., Gen. Ind., 179, 1840.

Dup., Cat., 226, 1844.

H.-Sch., Schm. Eur., iii, 7, 1847.

Steph., Cat. Br. Lep., 169, 1850.

Guen., Phal. i, 341, 1857.

Walk., List Lep. Brit. Br. Mus., xxii, 506, 1861.

\mathcal{L} and ♀.—Head square in front, the sides converging a little anteriorly. Antennae moderately pectinated. Palpi in the male large and bushy, extending well beyond the head, the third joint less than half as long as the second joint is wide; in the female, the third joint is somewhat longer, and the palpi project farther beyond the head than in the male. Fore wings very slightly subfalcate, the costa full near the subacute apex; the outer edge is rather more oblique than usual, and usually distinctly bent in the middle. The hind wings are elongated toward the inner edge, the anal angle projecting farther than usual beyond the tip of the abdomen; the outer angle is slightly bent. Venation much as in *Aplodes*, the posterior discal venule being curved as in that genus; the costal region becomes very narrow toward the apex, while the space usually represented by the subcostal cell is considerably wider than usual; the origins of the first and

second median venules are wider apart than usual. Hind legs long and slender, the tarsi very long and equaling the tibiae in length, the latter with four large spurs. The species are green, with scalloped or broad, straight lines.

The long, stout palpi, long hind wings and subfalcate fore wings, and broad, straight, oblique white bands and discal dots, as well as the large size of the species, will enable them to be readily recognized.

Our *G. iridaria* differs greatly in its markings from the European *G. papilionaria*; that species has faint scalloped lines and no discal dots.

Larva and pupa.—"Caterpillars a little elongated, pubescent, granulated, armed on the back with rough projections; head small; living on trees. Chrysalides rugose, grayish-brown (*grisés*), contained in thin silken cocoons among leaves."—Guenée.

GEOMETRA IRIDARIA Guenée. Plate 10, fig. 93.

Geometra iridaria Guen., Phal., i, 344, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 598, 1861.

4 ♂ and 4 ♀.—Wings entire: primaries slightly angulated in the middle. Hind wings rounded, extending farther beyond the tip of the abdomen than in *G. papilionaria*, while the antennae are less strongly pectinated than in that species. The palpi are stout and bushy; they are brown, white below. Head white, with brown scales in front, sometimes forming a line. Body and wings pea-green. Fore wings white on the costa, with brown scales on the basal half; two broad, white lines of the same width, the outer forming a common, fine, broad, oblique line, sometimes shaded with faint yellowish on the inner side of the common line and the outer side of the inner line. Small black discal dots on both wings; beneath, the dots are much more conspicuous; the lines faintly re-appear beneath. The fore wings are whitish on the hinder edge. Fore legs greenish at the base on the trochantines; legs white, with some black scales at the base; femora of all three pairs tipped with brown-black; tibiae brown at end, and tarsi washed in spots with pale brown. Abdomen green above, white below.

Length of body, ♂, 0.42, ♀, 0.36; of fore wing, ♂, 0.46–0.55, ♀, 0.50; expanse of wings, 1.00–1.55 inches.

Andover, Mass. (Sanborn); Brooklyn, N. Y. (Graef); Pennsylvania (Clemens); Maryland (Glover); Demopolis, Ala. (Grote); Lawrence, Kans. (Snow); Waco, Texas, May to October (Belfrage); Sanzalito, Cal. (Behrens).

This beautiful species may be at once known by the four black, raised, discal dots and black-tipped femora, as well as by the broad white bands and brown-mottled base of costa. It varies much in size, the larger individuals being larger than those of any other species of this subfamily.

The Californian examples are much larger, with slightly more pointed fore wings than in eastern examples: the fore wings of the largest of the two specimens measuring 0.75 inch, the largest eastern example (from New York) measuring 0.63 inch in length. Except the differences in size, I do not see any others to warrant a specific separation. The Californian examples closely resemble those from Texas, the lines being inclined to be straighter and less diffuse, and with less of a yellowish tinge to the wing than in examples from the Northern States. In the shape of the wings, the Texan examples closely approach the Californian ones, and thus differ in a corresponding degree from individuals from Alabama and the Middle and Northern States (Alleghanian fauna).

Desiderata.

Geometra inclusaria Walk., List Lep. Het. Br. Mus., xxii, 508, 1861.—
 “*Male and female.* Bright green. Body beneath and abdomen white. Head rosy; vertex white. Palpi porrect, extending a little beyond the head; third joint conical, not more than one-fourth of the length of the second. Antennae slightly pectinated to two-thirds of the length. Hind tibiae with four long spurs. Wings ample, with a black discal point, and with indistinct interior and exterior denticulated whitish lines; marginal line crimson; fringe yellowish white. Fore wings acute; costa white; exterior border hardly convex, moderately oblique. Hind wings extending beyond the abdomen.

“Length of the body 4–4½ lines; of the wings 11–12 lines.

“St. John’s Bluff, East Florida.”

This is a valid species, and distinct from *G. iridaria*.

Geometra mimicata Walk., List Lep. Het. Br. Mus., xxxv, 1601, 1866.—
 “*Female.* Bright green. Head, palpi, body beneath, and legs white. Palpi slender, decumbent, nearly as long as the breadth of the head; third joint as long as the second. Abdomen white, green toward the base, much shorter than the interior border of the hind wings. Wings broad, with two slender white lines; first line antemedial, nearly straight; second postmedial, inad-

lating. Fore wings acute; costa white; exterior border slightly convex, moderately oblique.

"Length of the body $2\frac{1}{2}$ lines; of the wings 8 lines.

"*a.* North America. From Mr. Carter's collection."

Iodis euechloraria Abb. Guen., Phal., i, 355, 1857.—"24^{mm}. Ailes supérieures aiguës à l'apex, à bord légèrement coudé, les inférieures ayant un angle marqué au bout de la 2, avec les bords droits; les quatre d'un beau vert-pomme clair de part et d'autre, avec la frange blanche, un peu rosée. Supérieures avec une ligne blanche à peine visible, droite, oblique, allant du milieu du bord interne aux deux tiers de la côte. Pattes concolores.

"Amérique septentrionale. Un ex. Coll. Bdy.

"Elle est mal conservée. Peut-être la ligne blanche est elle plus visible sur les individus frais. Le front est bombé, mais entièrement dénudé dans mon exemplaire."

Thalassodes deprivata Walk., List Lep. Het. Br. Mus., xxvi, 1559, 1862.—"*Male.* Pale green. Head ochraceous in front. Palpi porrect, smooth, extending very little beyond the head; third joint extremely minute. Antennae broadly pectinated. Abdomen not extending beyond the hind wings. Anterior legs mostly ochraceous. Wings with an exterior, pale, straight, oblique line. Fore wings acute; exterior border slightly convex, moderately oblique.

"Length of the body 4 lines; of the wings 10 lines.

"St. John's Bluff, East Florida."

Thalera superata Walk., List Lep. Het. Br. Mus., xxxv, 1612, 1866 — "*Female.* Sea-green. Body beneath and legs white. Head reddish; vertex white. Palpi reddish, slender, porrect, not extending beyond the head. Abdomen whitish, shorter than the interior border of the hind wings. Wings broad, with two slightly denticulated and undulating whitish lines; first line antemedial; second postmedial; fringe whitish. Fore wings acute; costa reddish, very slightly convex; exterior border slightly convex, rather oblique. Hind wings with the exterior border angular in the middle.

"Length of the body $3\frac{1}{2}$ lines; of the wings 11 lines.

"*a.* North America. From Mr. Carter's collection."

Subfamily BOARMINÆ Guenee (emend.).

Gnophidi, *Boarmidi*, and *Hybernidi* Guen., MS.; Dup., Cat., 1-44

Subtribes *Gnophites*, *Boarmites*, *Chorites*, *Amphidasites*, and *Hybernites* Dup., Cat., 1-44

Subfamilies *Choridi*, *Boarmidi*, and *Gnophidi* Steph., Cat. Br. Lep., 171, 173, 176, 180.

Families *Amphidasys*, *Boarmidi*, and *Hybernidi* Guen., Phala., i, 191, 213; ii, 211, 187

Walk., List Lep. Hb. Br. Mus., xx, 291, 310, 1860

Body moderately stout, sometimes very thick and hairy; the head, however, is smaller than usual in proportion to the body, while the male abdomen is rather long and slender, though occasionally stout. Head broad in front, the clypeal region being rather short. The palpi are usually stout and large, exceeding the front, with the first and second joints subequal in length; the third joint small, not distinct from the second. Male antennae either simple and ciliated or slightly pectinated or plumose. Wings moderately large or quite large. Fore wings triangular, with the costa usually straight, the apex more or less rounded, the outer edge sometimes serrate. Hind wings full and rounded, sometimes scalloped or serrate. Venation: the costal vein is usually free from the subcostal vein, sometimes (as in certain *Cymatophora*, *Cleora*, and *Gnophos*) anastomosing with the subcostal; the number of branches of the subcostal vein varies from five to six; when the subcostal cell is present, it is long, linear, irregular; only in *Cleora* is it rhomboidal as in the *Ennomina*. Hind legs sometimes with the tibiae much swollen, and the tarsi short in proportion. In style of coloration, the species are usually ash-gray, like the bark of the trees to which they cling; this granite-gray color is very persistent, the species of *Paraphia* forming an exception. When rubbed, the individuals of many of the species turn whitish.

The females of a few of the lower North American genera (*Anisopteryx* and *Hybernia*) are wingless.

Larva and pupa.—The caterpillars are either slender, with sometimes (*Anisopteryx autumnata*) a third pair of abdominal legs, and the head round, or, in the larger species (*Phigalia* and *Eubyja*), the head is square in front, each side ending in a tubercle; sometimes tuberculated on one or more rings of the body. Pupa brown, acutely conical, situated in leaves, or subterranean.

The venation of *Anisopteryx* and *Hybernia* is so much like that of *Eubyja* and *Biston* that I have removed them from the place usually

assigned them by authors, and regard them as true *Boarmiinae*, though with some aberrant features. *Phigalia* seems to connect *Anisopteryx* with *Eubryja* and *Tephrosia*, and I see no good reason for not placing the two latter genera in the same subfamily.

Synopsis of the Genera.

A. Head very small; palpi short; wings rather narrow, entire;
males often wingless:

- Male palpi very short; antennae simple, ciliated, or subpectinate; males ash-gray; females dull gray, unspotted; wings obsolete..... *Anisopteryx*.
Males like male *Anisopteryx*, but the antennae are pectinated, and the females have wings as long as the head..... *Phigalia*.
Male antennae subpectinated, with long, large cilia; the single American species of large size, light ochreous; females whitish, spotted with black.. *Hybernia*.

B. Head of the usual size but not prominent; body thick and stout;
species of large size; male antennae pectinated; palpi rudimentary; legs short:

- Wings large, triangular, outer edge usually very oblique; species large..... *Eubryja*.
Wings rather narrow, oblong, outer edge not very oblique; antennae very broadly pectinated; species of smaller size than in *Eubryja*..... *Biston*.

C. Body slender; palpi as well developed as usual; antennae often plumose; wings large, sometimes serrate; species usually ash-gray:

a. *Species ochreous:*

- Wings angular, serrate, especially in the females; the species subochreous, with white spots and blotches..... *Paraphia*

b. *Species wood-gray:*

- Antennae usually plumose; wings with a slight angle; front rather narrow; abdomen with two rows of black spots..... *Tephrosia*.
Wings entire; antennae rarely plumose; shorter palpi and hind legs than in *Tephrosia*..... *Cymatophora*.
Wings very large, broad, deeply scalloped; antennae plumose; palpi large and thick..... *Bronchelia*.
Much as in *Bronchelia*, but the wings short and broad, slightly serrate, while the species are smaller, and the antennae are simple or subpectinate..... *Guaphos*.
Species of large size; antennae heavily pectinated; wings deeply serrate..... *Homocophila*.
Species of very large size; head broad, unusually full in front and on the vertex; wings serrate..... *Stenotrachelys*.
Species of moderate size; wings broad, entire, semihyaline; antennae plumose; a clear, deeply-scalloped, extradiscal line common to both wings; discal dots distinct..... *Cleora*.

ANISOPTERYX Stephens. Plate 4, fig. 15.

Eraundis Hübn. (in part), Verz., 320, 1-18.

Alsophila Hübn. (in part), Verz., 320, 1-18.

Edonia Treits. (in part), Schm. Eur., vi (1), 252, 1-27.

- Hybernia* Dup. (in part), Lep. France, vii (ix), 391, 1849.
Anisopteryx Steph., Nomencl. Br. Ins., 13, 1829; Cat., ii, 116, 1829.
 Steph., Ill. In., 151, 1831.
 Boisd., Gen. Ins., 193, 1849.
Anysopteryx Dup., Cat., 235, 1844.
Alsophala Steph., Cat. Brit. Lep., 160, 1850.
Anisopteryx Lederer, Verh. Bot. Zool. Ges. Wien, 177, 1853.
 Guen., Phil., ii, 254, 1857.
 Walk., List Lep. Het. Br. Mus., xxiv, 1162, 1862.
Palaeocrita Riley, Trans. Acad. Sc. St. Louis, iii, 273, 1875.

Male.—Antennae subpectinate: the short tooth-like pectinations ending in long cilia, varying in size and length in the different species. Palpi very short, not reaching to the front. The head is rather full in front, much as in *Phigalia* and *Hybernia*. Fore wings with the costa straight, the apex usually less rounded than in *Phigalia* and *Hybernia*; the outer edge more oblique than in *Phigalia*. Hind wings usually more produced toward the apex than in *Phigalia*. Venation: the costal vein either free or anastomosing with the subcostal (varying in different individuals): subcostal cell long and narrow, much as in *Hybernia*, but rather wider, usually beginning at a considerable distance within the origin of the sixth subcostal venule, rarely beginning at the origin, as in the figure on plate I. The chief difference from *Hybernia* is in the origin of the median veins being situated much beyond the middle of the wing. Hind legs as in *Phigalia*.

Female.—Differs chiefly from *Phigalia* in the wings being almost entirely aborted, the rings of the abdomen smooth (*autumnata*) or armed with spines (*vernata*). The body is quite hairy in *vernata*, the scales being shorter and closer in *autumnata*.

Egg, larva, and pupa.—The eggs are either oval-cylindrical or subconical and truncate. The larva is smooth, cylindrical; the head smooth, rounded, not notched, and as wide as the body. In *A. autumnata*, there is a pair of rudimentary abdominal legs on the sixth abdominal segment. The caterpillar pupates a few inches under the earth. The pupa in the male (plate 13, fig. 6a) is much slenderer than in the female.

Both species of *Anisopteryx* differ from the European *ascalaria* in the fore wings being much less rounded at the apex, and in the hind wings being much more produced toward the apex.

While Mr. Mann has shown, with much ability, from a consideration of the imaginal characters, that we have two well-marked and perfectly distinct species, Professor Riley has carried the matter further, and judges,

from a comparison of the egg, larval and pupal states, as well as the imaginal, that not only are the two species distinct, but that there are really two genera, and for *vernata* he proposes the name *Palvacrita*. While his work shows great care and thoroughness, I am unable to agree with Mr. Riley's opinion that the differences he points out are of generic importance. The imaginal characters are certainly not so; for in other genera we have as great differences between the different species. The European *ascularia* would have to form the type of a third genus, if Mr. Riley's views are correct. We have seen that, as regards the larval characters, *vernata* in one case has an extra pair of legs, and the two species are sometimes easily confounded in the larval state. The eggs of the two species are very distinct; but the form and structure of the eggs in the *Phalaenids* have not been examined enough yet for us to form a decided opinion as to what are generic and specific characters among them.

ANISOPTERYX AUTUMNATA Packard. ♂, Plate 11, fig. 1: ♀, Plate 13, fig. 38.

Anisopteryx vernata Harris (in part). Inj. Ins. Mass., 332, 1841; 3d ed., 461, fig. 229?, 230, 1862.

Fitch (in part). Third Rep. Nox. Ins. N. Y., 25, 1856.

Pack. (in part). Guide Study Insects, 324, 1869.

Anisopteryx pomataria Mann, Proc. Bost. Soc. Nat. Hist., xv, 382, 1873; xvi, 163, 204, 1874.

Riley, Trans. Acad. Sc. St. Louis, iii, 273, figs. 18-21, 1875.

Male.—Six examples. Palpi shorter than in *A. vernata*; antennae subpectinate, ciliated, the cilia arising from much larger tubercles than in *A. autumnata*, and only one pair to a joint. Fore wings a little more elongated toward the apex, the outer edge being a little longer and more oblique than in *A. vernata*. Instead of being pale ash-gray as in *vernata*, this species is of a peculiar ochreous-brown tint, as in the European *ascularia*. There are two broad whitish bands on the fore wings; the basal is regularly curved outward, and is situated nearer the middle of the wing than usual; it ends on the costa in a dark spot. A faint, discal, linear streak. On the outer fourth of the costa, a broad, distinct, oblique white spot connecting with a broad, diffuse, zigzag, white line ending on the inner angle of the wing. A broken, linear, black thread at the base of the fringe. Hind wings clear, with a pale, indistinct, extradiscal line. Beneath is a pale costal spot connecting with the extradiscal faint shade, which is common to both wings.

Length of body, 0.40; fore wing, 0.65; expanse of wings, 1.38 inches.

Female.—Antennae not hairy (laid backward along the side of the body

when at rest in both sexes). The body is fuller and plumper, abdomen less acute at tip, and not spined as in *A. vernata*. It is unicolorous (black), with the anterior edge of the segments above (over which the legs move) mouse-colored. A row of five lateral dorsal black spots on the front edge of each segment (sometimes wanting). On the side is a row of five black dots situated nearer the middle of the segment than the large subdorsal spots. Antennae and feet concolorous with the body. Beneath, colors as above. Length of a gravid female, 0.40–0.42 inch.

For further descriptions of the head and thorax of this and the female *A. vernata* see the introduction, p. 38.

Salem, Mass., October and November, on elm and apple trees; much less common than *A. vernata* (Packard); Cambridge, Mass. (Harris, Mann, Morrison); November 20, 1848 (Harris).

Egg, larva, and pupa.—Egg cylindrical, increasing in diameter anteriorly, where it is truncated, being more rounded at the posterior end. On the anterior end it is slightly convex, with a dark rim around the edge and a central depression. Length, 0.03 inch. On the 9th of April, 1875, the eggs of this species were not developed, unless in a very early stage of the embryo. The larva is pale whitish-green as a ground-color, with a broad, brown, dorsal, median band and three lateral white lines, the middle of which is fainter than the two others. These are succeeded by a broad, brown, spinular line, below which is a broad, continuous, white line. Body beneath flesh-colored, without any median line. Head brown, with a whitish clypeal region. Six abdominal legs reddish flesh-color or whitish; the third smaller pair, situated on the fifth abdominal ring, are one-half or one-third as large as the adjoining ones, and are sometimes much smaller, while in two or three out of the twenty-seven specimens examined this pair was nearly obsolete. These specimens were gathered from several apple-trees, June 15, in my garden (Salem, Mass.). It varies a good deal, with a general tendency to become darker, approaching in some cases remarkably near *A. vernata* Harris in coloration, the brown lines being more prevalent, the light lines being finer and slightly interrupted.

There thus seems a decided tendency in the autumnal species to approach the spring (*vernata*); and as the latter is the more abundant and widespread, it is possible that *autumnata* is a derivation of *vernata*. As if in confirmation of this view, *vernata*, when it varies, becomes paler, and in some cases so

much so as to be only distinguished from *autumnata* by the absence of a third pair of abdominal legs, there being one exceedingly rare exception in this last character. It is possible that the two species were at first seasonal dimorphs. *A. autumnata*, however, according to Mr. Mann (Proc. Bost. Soc. Nat. Hist., xv, 384, 1873), does sometimes appear in the spring, as will be seen by the following quotation: "Of 16 dated specimens of the male in my collection, 12 were taken in October or November, and 4 in March or April. The two spring specimens in my collection now are among the most strongly characterized I have. Of several hundred females in my collection, four were taken in April and the rest in November."

Mr. Mann describes, in the Proc. Bost. Soc. Nat. Hist., xvi, a *female* of this species, which had two aborted wings and pectinated antennae.

As this species was wrongly called *A. vernata* Peck by Harris; and as Harris's *punctaria*, as shown by Mr. Mann, is Peck's *vernata*, it clearly follows that a new name must be proposed for Harris's "*vernata*"; I therefore propose *autumnata*, as it is on the whole an autumnal species.

ANISOPTERYX VERNATA Harris.* Plate 11, fig. 2, ♂; Plate 13, fig. 39, enlarged twice; larva, Pl. 13, fig. 6.

Phalaena vernata Peck, Mass. Mag., Sept., Oct., 323, 415, figs. 1-7, 1795. *

Not *Anisopteryx vernata* Harris, Inj. Ins. Mass., 332, 1841.

Anisopteryx punctaria Harris, Inj. Ins. Mass., 333, 1841; 3d ed., 462, figs. 228, 231, 1862.

Fitch, Third Rep. Nox. Ins. N. Y., 21, 1856.

Anisopteryx vernata var. *punctaria* Pack., Guide Study Insects, plate 8, figs. 9, 9a, 9b, 324, 1869.

Anisopteryx vernata Mann, Proc. Bost. Soc. Nat. Hist., xv, 382, 1873.

Anisopteryx punctaria Mann,† Proc. Bost. Soc. Nat. Hist., xvi, 463, 1874.

Anisopteryx vernata Mann, Proc. Bost. Soc. Nat. Hist., xvi, 204, 1874.

Palaearcta vernata Riley, Trans. Acad. Sc. St. Louis, iii, 273, figs. 14-17, 1875.

20 ♂.—Pale ash, body a little darker; head with often a slight, transverse, darker hair-line across the front just below the antennae. Fore wings crossed by three interrupted black lines, consisting of costal and venular black dots. Inner line much curved, on the costa forming an oblique black spot; the second line varying in position, being near the middle of the wing or on the inner third, and much nearer the inner line; it is straight, oblique on the costa, and a little sinuate; third line oblique, not sinuate, and deflected on the costa. A slender, black, apical, oblique streak, from which runs a zigzag, obscure, broad, whitish line to the inner edge; this line is much less distinct

* Although this species is not the *A. vernata* of Harris, yet, as he was the first to place the species in the correct genus, his name should follow the scientific name.

† The "*Anisopteryx punctaria* Harris descr." is not *A. vernata* of Mann.

than in *A. vernata*. A marginal row of intervenular black dots. Fringe paler, clear, concolorous with the hind wings. The latter pale ash, clear, without any markings, except a faint discal dot. Beneath, clear like the hind wings above and with four discal dots, those on the hind wings largest, with a costo-apical black spot; fringe concolorous with the wings.

Length of body, 0.30–0.40; fore wing, 0.59–0.67; expanse of wings, 1.12–1.28 inches.

It varies much in the distinctness of the lines, usually represented by spots on the costa, median vein, and inner edge.

Salem, February 25, March, April, and Boston, Mass. (Emerton, Sanborn, Packard); “New Haven, Conn.” (Herrick); Albany, N. Y. (Lintner); Illinois (Shimer, Riley); Missouri (Riley); Dallas, Tex. (Boll, Mus. Peab. Acad. Sc.).

The pale-ash transparent wings, the few black dots and costal spots, and oblique, apical, black streaks, and the four discal dots beneath, characterize this species. One of the two Texan specimens received only differs from Massachusetts examples in having the markings a little more distinct, the narrow black lines being more distinct than usual.

Female.—Pale gray. Body hairy, acute at the end of the abdomen, the scales loose, the body being somewhat hairy. Head dark; thorax whitish-gray; sides of body and beneath whitish-gray, with a lateral row of dark spots; sometimes a large square black spot on hinder part of the thorax. Antennae loosely ciliated. A dark stripe along the back, sometimes consisting of two black lines filled in with white between, or replaced by a row of white, dorsal, abdominal spots. Legs spotted and ringed with black. The segments of the abdomen armed with two irregular rows of sharp, distinct, slender spines. End of abdomen elevated in walking, more acute than in *autumnata*.

Length, 0.25–0.40 inch (fifty specimens described from life).

To show that, as stated by Messrs. Morrison and Mann, Peck had the present species before him when he drew up his account, I quote his original description, which applies throughout, as do his drawings, to the spring brood:—“Egg elliptic, $\frac{1}{16}$ of an inch in length, of a pearl colour with a yellowish cast. Eggs laid in thirteen days after the females appear.” In twenty-one days, “the worms appear, and have ten feet, of which four are posterior.” “The caterpillar is, when full grown, about nine lines long, the head pale, marked on each side with two transverse blackish stripes; the back ash coloured,

marked lengthwise, with small interrupted dusky lines; the sides blackish with a pale line along the length of the body; there are two white spots on the last segment of the body; the abdomen or under side is ash coloured." The chrysalis state, he adds, is entered upon in twenty-four hours after the larva has penetrated the earth: "and it appears that the insect is soon perfect, since a course of warm weather has been found to raise some of them from the earth in the month of November." (Here he evidently confounds the autumnal species with *vernata*.) "The body of the male is of an ashen-umber colour, almost five lines in length, extent of its upper wings one inch, two lines. The wings are ash coloured, with three obscure blackish transverse stripes, and a small dash of the same colour at the tip. The under wings are of an uniform colour, and rather lighter than the ground of the upper ones. The body of the female is nearly four lines in length, ash-coloured, and marked on the back with a brown list extending from the thorax to the tail. She is destitute of wings. Legs dusky, with white joints."

Peck's diagnosis is as follows:—" *Phalena (vernata *) geometra seticornis, alis cinereis; fasciis tribus obscuris fuscis, posticis immaculatis; femina aptera.*" The canker-worm is said by Peck to have been first observed in the Southern States, where it is probably a native, and may have been introduced into New England by the importation of trees from the Southern States. "It has been discovered on a plum tree." Mr. Peck made his observations in Kittery, Me. We have never observed it in Brunswick, Me., during several years' observations; but in 1875 it was said to be, for the first time, injurious in orchards in that town. While Peck's idea that it is a southern importation is probably incorrect, it is probable that it is indigenous to all parts of the country east of the Mississippi, as we have specimens from Texas, and as far north as Southeastern Maine, but is abundant only locally originally along the coast of Northeastern Massachusetts, and of late years in Illinois and Missouri.

Its native food-plant is the elm, and, according to Mr. John Sears, of Danvers, Mass., the black ash, both in deep woods and in the open meadow, as he has found the females ascending the trees; but it is usually more destructive to the apple and at times the cherry. In April, 1875, I noticed particularly *A. vernata* in my garden: none had appeared before the 10th and 11th, the season having been a very backward one. During these two days, which were warm and fine, I counted about one thousand males

* From its appearing early in the spring."

and two hundred females, mostly stuck to the inked bands on fourteen apple and three elm trees. There was not an *autumnata* to be seen among them. This may show, in a rough way, the numerical disproportion between the sexes—one male to five females. I also suspect that the males fly about one or two days before the appearance above ground of the females.

Egg, larva, and pupa. The egg is oval cylindrical, yellowish, the shell much thinner, and less dense, and rougher than in *A. autumnata*. They are laid in piles irregularly, not in flat cakes, side by side, as in *autumnata*. The larva is brown as a ground-color, with three broken, partly obsolete, white, dorsal threads, a broad, brown, subdorsal band, nearly twice as wide as the dorsal striped area. A lateral, broad whitish area broken by two broken brown lines, the lower part of the band being whiter than on the upper edge, and forming a narrow broken line more or less marbled with brown. This broken white line is the only line contrasting with the brown body, while in *autumnata* there are as a rule several such white lines. Beneath, a broad, whitish, median line, contrasting with the flesh-colored under surface.

The tendency to variation is in this species shown to consist in the body being whiter, the dorsal area being pale, with a dark lateral line, some specimens being pale, with a broken lateral line sometimes represented by isolated spots. It thus appears that the variation is in the direction of *autumnata*. The two species are of about the same size, though several out of the twenty-seven *autumnata* are larger than any of the seven hundred and thirty *vernata* examined.

Length of *vernata*, 0.70–0.80; of *autumnata*, 0.90 inch.

In one example, which on repeated examination I unhesitatingly pronounce to be *vernata*, as it agrees in all its other characters with that species, there is a *third pair of abdominal legs on the sixth segment!* These legs are well developed, as much so as in most *autumnata*, and provided with a perfect crown of hooks.

The pupae of the two species I have not myself studied. Mr. Riley describes that of *vernata* (male) as pitted, the wing-sheath extending to the fifth abdominal ring, with the terminal spine simple; while the pupa of *autumnata* (male) is not pitted, is darker brown than *vernata*, the wings reaching to the sixth abdominal ring, and with the terminal spine bifurcate.

The pupa of *autumnata* differs, Mr. Riley states, in the same way as in the male, but is relatively stouter and more arched dorsally, and with a broad,

dusky, dorsal stripe often visible toward the time of issuing,—all the more remarkable that there is no such stripe on the imago, when as in *vernata*, where the imago has such a stripe, it is not indicated in the chrysalis." Mr. Mann states (Proc. Bost. Soc. Nat. Hist., xvi, 163, 1874) that the pupæ of the *females* of *A. autumnata* have well-developed wings. He says they were developed "even to such a point that in all which I examined for the purpose, six or more, I counted the eight veins of the wings as ridges, and distinguished the fifth or intermediate vein as arising from the discal nervure." This will undoubtedly apply to the other species of this genus, and the family where the females are wingless. As to the causes for the abortion of the wings in the females, it seems probable that this remarkable secondary sexual character may have been originally due to seasonal changes acting on the adult insect, and become a matter of inheritance, as we know that wingless (or partially so) species of beetles and flies are the result of the physical agencies manifested on islands or from disuse. The local distribution of the canker-worm seems due to the fact that the females are apterous. We know that there are in the *Phalænidae* different grades of the apterous condition, hence the causes which produced such changes must have been comparatively slight.

PHYGALLA Duponchel. Plate 4, fig. 16.

- Apochama* Hubn. (in part), Verz., 319, 1818.
Amphidosis Tröts. (in part), Schum. Ent., vi (1), 229, 1825.
Phagata Dup., Lep. France, vii (iv), 296, 1829.
 " *Amphidosis* Steph. (in part), Cat. Lep., ii, 117, 1829."
Hybernia Boisd., Gen. Ind., 191, 1840.
Amphidasyg H. Sch. (in part), Schum. Eur., iii, 99, 1847.
Phigalia Steph., Cat. Br. Lep., 161, 1850.
 Lederer, Verh. Bot. Zool. Ges. Wien, 177, 1853.
 Guen., Phil., i, 195, 1857.
 Walk., List Lep. Het. Br. Mus., xvi, 297, 1860.

Male.—Antennæ well pectinated, the pectinations long and very slender. The palpi are a little longer, and the body is rather stouter than in *Anisopteryx*. Fore wings with the apex either as in *Anisopteryx* or more rounded; the outer edge is shorter, and the hind wings are shorter than in *Anisopteryx*. Venation: though so near *Anisopteryx* in its general appearance, it differs much in the venation: the costal vein is free from the subcostal; there are but five subcostal venules, no subcostal cell, and the subcostal venules are not curved up toward the costa as in *Anisopteryx* and *Hybernia*. The disposition of the median venules is more like that in *Anisopteryx* than *Hybernia*.

Female.—Differs from *Anisopteryx* in the partly-developed wings, the anterior pair being nearly as long as the head is broad.

Larva.—"Caterpillars with the first rings thick, having the trapezoidal areas raised into small piliferous pyramids on the intermediate rings and on the 11th; head flat and quadrangular; living on trees. Chrysalids subterranean."—Gueneé.

This genus differs from *Anisopteryx* in the well pectinated antennae and different venation; the markings being much the same in the two genera.

PHYGALIA STRIGATARIA Packard. Plate 11, fig. 3, ♂; plate 13, fig. 37, ♀.

Anisopteryx strigataria Minot, Proc. Bost. Soc. Nat. Hist., xiii, 84, 1869.

Hibernia olivacearia Morrison, Proc. Bost. Soc. Nat. Hist., xvi, 200, 1874.

9 ♂.—A much smaller, less pilose species than the European *P. pularia*, with the pectinations of the antennae much shorter. Pale ash with blackish-brown specks and lines. Head white on the vertex, brown on the front. Thorax whitish with a black collar, not extending, however, to the base of the wings. Two rows of black spots along the abdomen. Fore wings pale ash, speckled with dark brown; three blackish lines, the two inner parallel, the outer one diverging and parallel to the outer edge, often obsolete, indicated by distinct squarish, costal, black spots and venular marks. Inner line a little curved, the middle one straight; outer sinuate. A diffuse, faint, broad marginal shade edged with whitish. A row of intervenular black spots on the edge of each wing. Hind wings whitish, finely dusted with dark scales, with three lines, the middle the most distinct, and the inner and outer usually present only on the inner edge. Beneath paler, smoky-ash, with the middle lines faintly shown. Costa of fore wings thickly speckled; four indistinct discal dots also seen beneath.

Length of body, 0.45–0.5; fore wing, 0.65–0.85; expanse of wings, 1.35–1.60 inches.

It varies greatly in size and in distinctness of the lines, some small individuals with partly obsolete lines closely resembling *A. cernata*, and in the distinctness of the bands on the hind wings; also in the distance between the two outer lines on the hind edge of the fore wings, in some the two touching each other on the edge of the wing. It differs from *Anisopteryx cernata*, with which, when small, it may be easily confounded by the broadly-pectinated antennae, by the black collar, by the much shorter hind wings, the tip of the abdomen reaching to the inner angle.

West Roxbury, Mass., April (Sanborn and Minot); Massachusetts (J. C. Merrill, Bost. Soc. Nat. Hist.); Albany, N. Y. (Lintner); West Farms, N. Y. (Angus); Philadelphia, Pa. (Ent. Soc.); Illinois (Ridings); Dallas, Tex. (Boll, Mus. Peab. Acad. Sc.).

2 ♀.—The females are light stone-gray, with an indistinct double row of dorsal black spots. The wings are quite well developed, reaching to the posterior edge of the second abdominal segment; they are pale ash, and each one is crossed by a fine black line.

Length, 0.50 inch.

Cambridge, Mass., April 25 (Morrison), labeled "*olivacearia*, type".

The artist has not drawn the female well, the posterior half of the body behind the wings being too full—too much like *Anisopteryx*.

I am inclined, after an examination of a type-specimen, to refer Mr. Morrison's *H. olivacearia* to this somewhat variable species.

HYBERNIA Latreille. Plate 4, fig. 17.

Erannus Hübner (in part), Verz., 3, 9, 1818.

Hybernia Latreille, Fam. Nat., 477, 1825.

Endonia Treits. (in part), Schum. Ent., vi (iv), 262, 1827.

Anisopteryx Steph. (in part), and *Lampetia* (in part), Nomencl. Br. Ins., 63, 1829.

Hybernia Dup., Lep. France, vii (iv), 304, 1829.

Dup., Cat., 234, 1844.

Boisdu, Gen. Ind., 194, 1849.

H.-Sch., Schum. Ent., iii, 58, 1847.

Erannus Steph., Cat. Br. Lep., 160, 1850.

Hybernia Lederer, Verh. Bot. Zool. Ges. Wien, 1853.

Hybernia Guen., Phid., ii, 239, 1857.

Walk., List Lep. Het. Br. Mus., xxiv, 1157, 1862.

Male.—Antennae subpectinated, each pectination being tuberculiform, and ending in a pencil of long hairs. Palpi very short, not reaching as far as the front. The head in front is smaller, but the scales project more than in *Anisopteryx* and *Phigalia*. Fore wings much rounded toward the apex, the outer edge very oblique, nearly as long as the inner edge. The hind wings longer than in *Anisopteryx* and *Phigalia*, the outer edge shorter and less full than in the two other genera mentioned. Venation: the costal vein is free from the subcostal; there are six subcostal venules, and their disposition is much as in *Anisopteryx*, but less curved up toward the costa; the second subcostal venule is twice as long as in *Anisopteryx*. *Hybernia* differs from both the two genera mentioned in the first median venule co-originating with the second. Our single American species is ochreous in color.

Female.—The wings are nearly as minute as in *Autospycha*; the legs are larger than in either of the other two genera, and the head is a little fuller in front.

Larva.—"Caterpillars more or less elongated, cylindrical a little carinated laterally, with a spherical head: living exposed on trees and bushes. Chrysalids subterranean."—Guenee.

This genus differs from the American species of the two previously mentioned in the much rounded fore wings, the smaller, fuller front of the head, the long hind wings, and the ochreous color of the single species known.

HYBERNIA TILIARIA Harris.

Hybernia tiliaria Harris, Inj. Ins. Mass., 341, 1-11; 3d ed., 472, fig. 236, ♀, 1862.

♂.—Pale ochreous, with light-brown specks and bands. Head, body, costa, and transverse band on the wings concolorous, being pale brown. Fore wings with a faint, curved, sinuate, diffuse inner line; outer line dark brown, slightly sinuate, with a large obtuse angle on the independent vein. It is shaded externally with a broad pale-brown band, which breaks up into flecks on the outer edge; on the costa, the outer edge is directed obliquely toward the apex. Outer edge of wing as within the band. A well-marked discal dot. Hind wings without any markings, somewhat paler than the anterior pair. Beneath, of the same color as above, the outer dark line appearing; discal dots very faint on the fore wings and distinct on the hind wings, where they do not appear above.

Length of body, 0.60; fore wing, 0.90-0.95; expanse of wings, 2.00 inches.

Brunswick, Me., October (Packard); Salem, Mass. (Emerton); Boston, Mass. (Sanborn); Albany, N. Y. (Lintner and Meske); Philadelphia, Pa. (Ent. Soc.).

It differs from *H. progemmaaria* of Europe, to which it is closely allied, by wanting the marginal row of black dots and the line on the hind wings, while the outer line on the fore wings is more angulated than in the European species; and in wanting the discal dot on the hind wings, though in additional specimens this may occur. Occasionally a specimen is much suffused, the lines forming a broad shade.

Female (four examples).—The female of this species differs from any other of our wingless species by its much larger size, the white ground-color

of the body, and the double dorsal row of black spots. In one specimen, the body is quite uniformly mottled with black, and the dorsal spots are not clearly indicated. Length, 0.50 inch.

Larva.—"It is larger than the canker-worm and very different from it in appearance. It is of a bright yellow color, with ten crinkled black lines along the top of the back; the head is rust colored; and the belly is paler than the rest of the body. When fully grown, it measures about one inch and a quarter in length. It often rests with the middle of the body curved upwards a little, and sometimes even without the support of its fore-legs. The leaves of the lime seem to be its natural and favorite food, for it may be found on this tree every year; but I have often seen it in considerable abundance, with common canker-worms, on other trees (elm and apple trees). It is hatched rather later, and does not leave the trees quite so soon as the latter. About or soon after the middle of June it spins down from the trees, goes into the ground, and changes to a chrysalis in a little cell five or six inches below the surface; and from this it comes out in the moth state towards the end of October or during the month of November. More rarely its last transformation is retarded till the spring. The eggs are laid in little clusters, here and there on the branches. They are of an oval shape, and pale yellow color, and are covered with little raised lines, like net-work, or like the cells of a honey comb."—Harris, 341, 1841.

EUBYJA Hübner. Plate 4, fig. 18.

Eubyya Hübn., Verz., 318, 1818.

Amphidasis Treits. (in part), Schum. Eur., vi (i), 229, 1827.

Dup., (in part) Lep. France, vii (iv), 268, 1829.

Biston Steph. (in part), Nomencl. Br. Ins., 43, 1829.

Amphidasis Boisdu. (in part), Gen. Ind., 195, 1840.

H.-Sch. (in part), Schum. Eur., ii, 99, 1847.

Biston Steph. (in part), Cat. Brit. Lep., 163, 1850.

Biston (in part) and *Amphidasis* Lederer, Verh. Bot. Zool. Ges. Wien, 177, 1853.

Amphidasya Guen., Peul., i, 206, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 305, 1860.

Body very stout and hairy, particularly on the thorax. Head large and prominent, broad between the eyes and on the vertex. Palpi short and slender, not reaching the front. Antennae heavily pectinated nearly to the tip, though the branches are shorter than in *Biston*. Fore wings long and narrow, with the apex much produced, the costal edge being much curved toward the apex, while the outer edge is long and unusually oblique, and as

long as the inner edge of the wing. The hind wings are short, scarcely reaching to the end of the abdomen. Venation somewhat as in *Phygadeuon*, but the discal venules are situated in the middle of the wing, and there are six subcostal venules: the first and second subcostal venules are thrown off from a common branch, and both curve alike toward the costa. In coloration, the species are much as in those of *Biston*; but the extradiscal line is distinctly angulated, where it is not bent in *Biston*. The abdomen is perhaps rather longer than in *Biston*.

Larva.—Ramiform, large, and with a notched head. The pupa is subterranean.

There is no good reason why Hübner's name *Eubrya* should not be adopted; besides having the priority over Treitschke's, it is defined and limited in accordance with the genus as it now stands.

Synopsis of the Species.

A. Wings broad, white as a ground-color:

The extradiscal line very angular, especially on first median venule *E. quernaria*.
Like *quernaria*, but the extradiscal line on the hind wings not bent outward *E. eupatoriæ*.

B. Wings narrow, ash-colored:

Extradiscal line bent at right angles on the independent, not wavy *E. angustata*.

EUBRYA QUERNARIA Smith-Abbot. Plate 11, fig. 6.

Phalaena quernaria Smith-Abbot, Lep. Ins. Georgia, ii, 205, pl. 103, 1797.

Amphidasis quernaria Guen., Phal., i, 265, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 397, 1866.

1 ♀.—Body stout; abdomen thick, with a dorsal row of four large tufts, the fourth white, the others dark. Antennae black. Head in front and palpi black-brown; vertex white, rounded behind by a black thread-line; thorax white, with two black spots in the center, and spotted with black posteriorly. Abdomen white on the outer third, with a white interrupted line on each segment, spotted thickly on the under side with white. Legs brown, spotted with white. Fore wings long, outer edge very oblique, snow-white as a ground-color; basal third white, mottled with deep brown, especially on the costa. The middle third of the wing brown, bordered with the black basal and extradiscal lines. The basal line is deeply and regularly curved outward; the extradiscal is irregularly and deeply scalloped; it runs

straight from the costa to the great angle on the median line, through two deep scallops; the angle is jagged and sharp, and below the line forms a great curve, sending a point outward on the internal vein. Beyond this line the wing is white, with scattered dark specks, and with a ferruginous patch just below the sixth submedian, and a larger one extending from the second median venule to the inner edge of the wing near the angle. Hind wings white, more or less densely mottled with brown on the inner two-thirds; the extradiscal line is zigzag, with a large angle in the middle of the wing. Beyond this the markings repeat those of the fore wings; beneath, the same style of markings is repeated.

Length of body, ♀, 0.72; of fore wing, ♀, 1.00; expanse of wings, 2.20 inches.

Cambridge, Mass. (Harris's Coll.).

While *cupidaria* is possibly the male of this species, it seems to differ decidedly in the large angle of the extradiscal line on the hind wings especially.

Larva.—"La chenille est plus courte que celles de nos *Amphidasys* européennes, d'un brun marbré de jaune-roussâtre, avec une raie latérale plus claire. Le ventre est rosé entre les fausses pattes, et le 1^{er} anneau est d'un jaune d'ocre. Elle a une caroncule sur le 5^e et une sous le ventre du 6^e, outre celle du 11^e, qui est commune à tout le genre. Au repos, elle tient ses premiers anneaux très-ramassés, en sorte qu'elle paraît avoir une bosse très-élevée. Elle vit en avril et mai sur les *Quercus* (Guénée).

The above description may apply to this, but the following one is drawn up from an unpublished drawing of Abbot's in the library of the Boston Society of Natural History. Body stouter and shorter than in the larva of *E. cognataria*. Head angular; prothoracic segments swollen; a tubercle on the back of the third, the lower part of the side of the front, and on the back of the penultimate segment. The body is colored in the drawing slate-gray, with irregular dark spots and longitudinal slashes. The food-plant drawn on the plate is *Crataegus australis* T. and G.

AMPHIDASYS CUPIDARIA Grote. Plate 11, fig. 5.

Amphidasys cupidaria Grote, Proc. Ent. Soc. Phila., iii, 531, pl. 6, fig. 8, ♀, 1861.

The antennae are much more heavily pectinated than in *A. cognataria*, the pectinations reaching nearly to the end. It is known by wanting the black collar, the three large white patches on the costa of the fore wings, and

the broad, blackish, median shade, lined with white, the outer edge being sinuate and slightly angulated on the first median venule.

A specimen from Bridgton, Me., has been received from Dr. Perley, which agrees with Grote's figure and description, except that he does not mention or figure the black mesial line on the hind wings as being a little angulated on the base of the first median vein, as it is in our specimen. It is a male, which is too much rubbed to describe.

Length of body, ♂, 0.65; fore wing, ♂, 0.85; expanse of wings, 1.15 inches.

AMPHIDASIS COGNATARIA Guenée. Plate 11, fig. 1.

Amphidasis cognataria Guen., *Phal.*, i, 298, 1857.

Walk., *List Lep. Het. Br. Mus.*, xxi, 397, 1860.

3 ♂ and 2 ♀.—Of an ash, pepper-and-salt, or wood-brown color, being speckled densely with blackish-brown. Prothorax and head part way down the front white; front below smoky-brown. Hind edge of the prothorax with a black line or collar extending to the base of the costal edge of the front wings. An indistinct, diffuse, inner, curved line, with a second one nearer, and diverging a little on the costa, being nearer together at the base, both dilating and forming prominent costal spots. A third diffuse (often obsolete except on the costa) line incloses the discal spot. An outer distinct black hair-line always present; it is sinuate, with a large obtuse tooth on the independent venule. A blackish costal patch half-way between the apex and termination of the fourth and outer line. Hind wings with three lines, an outer distinct hair-line, as on the fore wings, angulated on the independent venule. A diffuse line crosses the middle of the wing, inclosing the discal dot; a marginal, pale, diffuse, interrupted, narrow line runs through the middle of the margin of the wing (in one female, all the lines are wanting except the outer hair-line). Abdomen with two rows of obscure black spots. Beneath, much paler, with all the lines reproduced faintly.

Length of body, ♂, 0.70, ♀, 0.70–0.80!; fore wing, ♂, 0.95, ♀, 0.95–1.20; expanse of wings, 2.10 inches.

It may at once be known by the narrow fore wings, with the outer edge longer than usual, and by the common black hair-line, with a broad tooth on the independent venule.

Brunswick, Me., July (Packard); Salem, Mass. (Emerton); Albany, N. Y. (Lintner and Meske).

It represents the European *A. betularia*, but is much more densely speckled.

Larva.—I have raised it at Brunswick, Me., from the Missouri currant. According to my recollections, it is a large thick worm, with a few small tubercles, the head notched, the body of the same thickness throughout, and dark brown. The pupa is brown, of the usual shape, and is subterranean.

BISTON Leach.

"*Biston* Leach, Edin. Encycl., ix, 434, 1815."

Egyia Hübner, (in part), Verz., 349, 1818.

Amphidasis Treits., (in part), Schin. Eur., vi (c), 229, 1827.

Dup., (in part), Lep. France, vii (iv), 268, 1829.

Biston Steph., (in part), Nomencl. Br. Ins., E3, 1829.

Amphidasis Boursl., Gen. Ind., 195, 1840.

H.-Sch., Schin. Eur., iii, 39, 1847.

Biston Steph., (in part), Cat. Br. Lep., 163, 1859.

Ledener, (in part), Verh. Bot. Zool. Ges. Wien, 177, 1853.

Guen., Phal., i, 204, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 303, 1860.

The species of *Biston* are distinguished from those of *Amphidasis* by the smaller, more sunken head, the more hairy spherical thorax, and the rather smaller, shorter abdomen. The fore wings have the costa straight, not curved toward the apex, which is subrectangular, while the outer edge is much less oblique, and is a good deal shorter than the inner edge of the wing. The hind wings are a little larger proportionally than in *Amphidasis*. In coloration, the species of *Biston* differ from those of *Amphidasis* in the three dark lines on the fore wings being subparallel, the outer one not being bent.

Larva.—"Caterpillars cylindrical, smooth, without other eminences than the trapezoidal ones which form two small isolated points on the 11th ring; head globular; living on trees. Chrysalides quite short, subterranean."—Guenée.

BISTON URSARIA Walker. Plate 11, fig. 7.

Biston ursaria Walk., Can. Nat. and Geol., v, 261, 1860; List Lep. Het. Br. Mus., xxi, 305, 1860.

2 ♂ and 1 ♀.—Body and wings dark granite-gray. Antennæ black, in the male heavily pectinated. Palpi blackish. Body concolorous with the wings; the thorax is a little darker than the abdomen, with two transverse dark lines and a v-shaped line behind. Fore wings uniformly dark granite-gray, darker and more densely speckled than in *B. hirtarius* of Europe, with three transverse, obscure, dusky lines, as in *hirtarius*, represented by black spots on the

costa and on the veins, with obscure lines connecting them, though in well-preserved specimens the lines are clear and continuous. Base of the wing dark. Inner line well curved; second and third lines nearer together than in *Tetrarhis*, especially on the inner edge of the wing. Half way between the third line and the outer edge of the wing is a fainter band than the others, represented by a costal square spot, and a black spot on the inner angle. The fringe is concolorous with the wing, being a little paler at the ends of the veins, but not so distinctly checkered as in the European species. Hind wings with three transverse diffuse bands: when rubbed, they are represented by the squarish spots on the inner edge, where the wing is more thickly scaled than in the middle, the wing being more hyaline than in *B. hirtarius*. Beneath, paler than above; outer edge of the wings somewhat frosted; apex of both wings whitish; second and third lines reproduced, ending in two costal black spots. Hind wings with two faint lines and two costal spots. Legs and body beneath very hairy, concolorous with the upper surface.

Length of body, ♂, 0.75, ♀, 0.85; fore wing, ♂, 0.85, ♀, 1.00; expanse of wings, 1.55–2.00 inches.

Albany, N. Y., "April 8" (Meske).

It may be known by the thin semi-transparent wings, pepper-and-salt color, and three parallel, broad, diffuse, dark lines, and the hairy, long branches of the antennae.

PARAPHIA Guenée. Plate 4, fig. 19; plate 5, fig. 1.

Paraphia Guen., Phal., i, 271, 1857.

Walk., List Lep. Het. Ec. Mus., xxi, 423, 1860.

Amilapis Guen., Phal., ii, 92, 1857.

Male antennae well pectinated. Palpi rather slender, projecting a little beyond the front, which is rather narrow in the male, more so than in *Tephrosia*. Fore wings with the costa moderately convex compared with *Tephrosia cognataria*, for example; the apex is subacute. Outer edge bent in the middle, entire in the male, in the female distinctly serrate. Hind wings squarish, with a prominent angle in the middle of the outer edge, slightly dentate in the male, conspicuously so in the female. Venation: costal vein free from the subcostal; first subcostal venule branched within the middle, the lower branch not arising, as usual, from the main vein; six subcostal venules, where there are but five in *Tephrosia*; the first and second median venules co-originate, where in *Tephrosia* and *Cynatophora* they are

separated at their places of origin. Hind legs with the tibiae much swollen; tarsi nearly as long as the tibiae. Coloration: pale gray, with a decided ochreous tint.

The species of this genus may be easily recognized from the others of the subfamily by the ochreous tints, the deeply serrate and angled wings of the females, and the angled male wings, as well as the narrow front of the head. The sexes differ more than usual, and the species are exceedingly variable.

Synopsis of the Species.

Clear fawn-color, with a distinct subapical white spot.....*P. unipunctaria*.
Whitish, rarely tinted with ochreous.....*P. subatomaria*.
Fore wings smaller, subochreous, with a median whitish band, beneath ochreous.....*P. deplanaria*.

PARAPHIA UNIPUNCTARIA Packard. Plate 11, fig. 10.

Geometra unipunctata Haw., Lep. Br., 345.

Wood, Index, 747, 1833-39.

Amilapis unipunctata Guen., Phal., ii, 62, 1857.

2 ♀.—Of a uniform clear fawn-color, without the usual spots and speckles; a basal, brown hair-line bent outward acutely on the median vein; a broad, diffuse, dark median band (wanting in one example) common to both wings. The extradiscal line is dark, finely scalloped, curved outward below the costa and sweeping inward below the first median venule; beyond this line both wings are deeper fawn-color. At a little distance below the costa, and nearer the extradiscal line than the outer edge of the wing, is a conspicuous, angular, clear, white spot. Fringe dark, the scallops filled with whitish. Hind wings like the anterior pair, but the extradiscal line is not sinuous but curved regularly outward. Beneath, paler than above; the median band is distinct, and the extradiscal line more or less so; the tints are much as above.

Length of body, ♀, 0.40.; of fore wing, ♀, 0.66; expanse of wings, 1.40 inches.

Texas, August 11 (Belfrage).

This pretty species is so different from the two other species that it is easily recognized by the absence of the clouds and spots and by the clear fawn-color above and beneath. The single subapical spot seems to be a permanent character. So different is it from the other species that M. Guenée was misled into regarding it as the type of a distinct genus.

Larva.—"Caterpillar of a yellowish-green, with the sides washed with reddish, and the head of this last color. It lives on several trees, as the elm, oak, '*courrouiller*' etc." The chrysalis is blackish, with the wing covers tinted with rose-flesh color."—Gueneé, description of Abbot's drawing.

PARAPHIA SUBATOMARIA Gueneé. Plate 11, fig. 8.

Paraphia subatomaria Guen., Phal., i, 272, 1857.

Paraphia nubecularia Guen., Phal., i, 272, 1857.

Paraphia mamurraria Guen., Phal., i, 273, 1857.

Paraphia subatomaria Walk., List Lep. Het. Br. Mus., xxi, 424, 1860.

Paraphia nubecularia Walk., List Lep. Het. Br. Mus., xxi, 424, 1860.

Paraphia mamurraria Walk., List Lep. Het. Br. Mus., xxi, 424, 1860.

Paraphia piniata Pack., New and Little Known Insects, 14, 1870.

7 ♂ and 2 ♀.—Wings somewhat pointed toward the apex, distinctly serrate, and angulated in the middle, especially on the hind wings. Body and wings whitish-ash, speckled with dark-brown and ochreous scales. Fore wings with three lines, the inner much curved, and sometimes more or less dislocated on the costa, making it sinuous; median band nearly straight, either faint when the discal dot is conspicuous or the line heavy, more or less diffuse and expanded on the veins; outer line regularly sinuate, subdentate, a diffuse ochreous patch beyond in the middle of the wing; sometimes the line is shaded with dark externally and the ochreous patch is obscured; a dusky diffuse patch in the extradiscal space, and another near the anal angle of the wing; just within the extradiscal dark patch from one to three rounded white patches, one especially well marked. Fringe checkered with white and dark. Hind wings as in anterior pair, with two lines, the inner diffuse, nearly straight, the outer line dentate, curved below the costa (sometimes the costal portion of the line wanting); beyond, as in the fore wings; beneath, whitish, with few speckles, rarely slightly ochreous; discal dots distinct; an outer, common, sinuate line, consisting often of more or less disconnected dots; speckles thicker nearer the base of the wing; the inner line sometimes present, then heavy, diffuse, and both lines well marked by triangular costal spots. Female either pale whitish or with a decided ochreous tinge; the two inner lines forming broad shades, especially the middle, which in one case is decidedly sinuate; the three white spots distinct, and the wings rather densely speckled with brown; beneath, whitish, or with a slight ochreous tinge, the inner shade present on both wings, while the outer line, common to both wings, consists of a row of dots.

Length of body, ♂, 0.58, ♀, 0.65; of fore wing, ♂, 0.65, ♀, 0.85; expanse of wings, 1.30–1.70 inches.

London, Canada (Saunders); Brunswick, Me. (Packard); Beverly, Mass., June 26 (Burgess); Boston, Mass. (Sanborn); Brookline, Mass. (Shurtell, Coll. Bost. Soc. Nat. Hist.); Springfield, Mass. (Dimmock); Natick, Mass. (Stratton); West Farms, N. Y. (Angus); Albany, N. Y., June 17 (Lintner); Philadelphia, Pa. (Grote and Ent. Soc.).

This species may be recognized among all the variations different specimens present by the white color, rarely subochreous, the base and outer edge of the wing being as pale as the middle portion, and by the pale under side of the wings and its large size.

It varies greatly in the distinctness of the lines and the degree of irroration. In some, the lines are diffused, and the species is rather more heavily dusted than *deplanaria*. Guenée's description of *P. nubecularia*, described from one male, agrees with some of my heavily-dusted specimens; and his *P. mamurraria*, described from one male, agrees with some of my specimens.

Larva.—The moth has been raised by Mr. W. Saunders, of London, Canada, from a "brown geometric larva on the pine, the imago appearing June 24th."

PARAPHIA DEPLANARIA Guenée. Plate 11, fig. 9.

Paraphia deplanaria Guen., Phal., i, 272, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 121, 1860.

Macaria fidoniata Walk.!!! (Grote Coups.), List Lep. Het. Br. Mus., xxi, 924, 1861, "Hindustan."

10 ♂ and 4 ♀.—In this species, the antennæ are well pectinated, but the wings are rather shorter, less produced toward the apex than in *P. subatomaria*. Wings ochreous-ash, the head and body uniformly tawny-brown. Fore wings with three brown lines, the innermost bent nearly at right angles in the discal space. The less distinct middle line is straight, and situated just within the distinct discal dot. Between this and the outer line, the wing is whitish and freer than usual from the transverse brown speckles on the other parts. The outer line is regularly sinuate, slightly dentate. Beyond is a broad, ochreous, diffuse shade, succeeded by a brown submarginal shade, disappearing in the extradiscal space, above which, *i. e.*, in the last subcostal space, is a large, round, conspicuous, white spot (sometimes there are two or three white spots below this). Fringe checkered with white and dark brown. Hind wings pale ash within the outer line, with a slight ochreous

tint, but deep ochreous beyond. Inner line faint; discal dot very distinct; outer line distinct, nearly straight. Beneath uniformly ochreous; with the outer common line very distinct, consisting of a row of blackish dots; on the hind wings, it is bent opposite the distinct discal dot. The base of the fore wing is rather densely shaded with dark specks, and there is a very faint submarginal shade. Legs concolorous with the body, speckled. The wing is whitish in the middle, with the white spot distinct. In one case, the margin of both wings above is lilac-ash.

Length of body, ♂, 0.43–0.50, ♀, 0.45; of fore wings, ♂, 0.60, ♀, 0.65; expanse of wings, 0.90–1.35 inches.

Maine (E. S. Morse); Beverly, Mass., July 8 (Burgess); Boston, Mass. (Sanborn, Mus. Bost. Soc. Nat. Hist.); Natick, Mass. (Stratton); Lynn, Mass. (W. H. Dall); Hastings-on-Hudson, N. Y., June 19 (Grote); Albany, N. Y. (Lintner); West Farms, N. Y. (Angus); Philadelphia, Pa. (Ent. Soc. and Grote); Pennsylvania and Maryland (Mus. Comp. Zool.); Illinois, (Clemens); Texas, May (Beltrage).

This species is perhaps more common than the other. The male may be distinguished by its smaller size, by the wings being more ochreous, by the distinct discal dots, and by the rather distinct median white band on the fore wings. The female differs greatly from the male, being much larger and with the wings more serrate, the two inner lines more or less obsolete, the border of both wings being much darker than the inside of the wing, the border sometimes having a lilac tinge. From the female of *P. scabromaria*, it differs in its still smaller size, in having usually but one subapical spot, instead of three, as is usually the case in the other species, and in the outer border of the wings being darker or more decidedly ochreous. The wings are serrated much alike in the two species, but more decidedly in the female of *P. deplanaria* than that of the other species. It is a very difficult genus, and impossible to study properly without a large amount of specimens. It would be easy for one to be led into making half a dozen "species" if he had but one or two specimens of each variety.

TEPHROSIA Boisduval. Plate 5, figs. 2, 2*b*, 2*c*.

Scidosema Hübn. (in part), Verz., 299, 1818.

Anagoga Hübn., Exot. Schm., 31, 1825.

Gnophos Treits. (in part), Schm. Eur., vi (1), 160, 1827.

Halia Dup. (in part), Lep. France, vii (1), 400, 1829.

Ourmia Steph. (in part), Ill., iii, 103, 1831.

- Tephrosia* Boursd. (in part), Gen. Ind., 198, 1840.
 Dup. (in part), Cat., 228, 1841.
Boarmia H.-Sch. (in part), Schum. Eur., iii, 76, 1847.
 Steph., Cat. Br. Lep., 174, 1850.
 Lederer (in part), Verh. Bot. Zool. Ges. Wien, 177, 1853.
Tephrosia Guen. (in part), Phal., i, 258, 1857.
 Walk. (in part), List Lep. Het. Brit. Mus., xxi, 398, 1860.

Front of the head rather square. Palpi very stout and thick, scarcely passing beyond the front (*T. canadaria*), or slender, with the third joint acute and passing a little beyond the front (*T. cognataria*). Male antennæ well pectinated, plumose. Fore wings with the costa straight, usually straighter than in any other genus of the subfamily. Apex rectangular, subacute; outer edge of the wing not bent. Hind wings rather square, with a slight bend in the middle of the outer edge, slightly dentate in *T. canadaria*, usually entire; apex slightly produced. Venation: usually but five subcostal venules (six in *T. californiaria*, plate 5, fig. 2 *b*), where there are usually six in *Cymatophora*; the first and second median veins arise farther apart than in *Cymatophora*. No subcostal cell. Hind legs long and slender, either with the male hind tibiæ slender and the tarsi three-fourths as long as the tibiæ (*T. cognataria*), or the hind tibiæ are very long and swollen, and the tarsi are one-third as long as the tibiæ.

In coloration, the species usually closely resemble those of *Cymatophora*, and are distinguished from that genus by the more plumose male antennæ, the more angular wings, the narrower front, longer hind legs, while some of the species are pearl-colored (*T. cognataria*), and nearly all have two well-marked rows of black spots along the abdomen.

The genus *Tephrosia* as limited by Duponchel and Guenée is in part composed of species of *Cymatophora* (*Boarmia*). *C. consonaria* and *crepuscularia* are certainly not *Tephrosiæ*, though Guenée regards them as the typical species of the genus. The genus is represented in Europe by *T. punctulata*, a representative of our *T. anticaria*. The genus is very much better represented in this country than in Europe.

Larva.—The larvae differ from those of *Cymatophora* in being smooth. The larva of *T. punctulata* is said to be smooth, and of a reddish color, with white spots or blotches on the back of all the segments. It feeds on the birch.—(Newman.)

Synopsis of the Species.

A. Hind tarsi longer than the tibiae :

Pearl-colored, with two rows of black dots, *T. cognataria*.

B. Tarsi shorter than the tibiae :

Reddish brown, densely speckled with dark scales, *T. californiana*.

Clear reddish-brown; fore wings falcate, *T. falcataria*.

Medium-sized; dull ash-gray; with three rows of close-set black spots, *T. antioquia*.

Larger hind tarsi nearly as long as tibia; whitish ash; with five rows of black spots, *T. cribrataria*.

The largest species; hind tibiae very long; tarsi very short, ash-gray, *T. canadaria*.

TEPHROSIA COGNATARIA Packard. Plate 11, fig. 11.

Anagoga cognataria Hübn.-Geyer, Exot. Schm., Zuträge, 31, figs. 549, 550, 1-25.

4 ♂ and 2 ♀.—This singular species differs from *T. cribrataria* in the longer, much slenderer legs, the hind tibiae being very slender, while the tarsi are very long, in fact longer than the tibiae, while in *T. cribrataria* they are shorter. The antennae are just as in *T. cribrataria*, the pectinations being long and inclined to be interlocked. It also differs in the want of the usual markings. Body and wings dull pearly-ash. Head whitish on the vertex, and along the upper side of the antennae. In front, brown in both sexes. Fore wings uniformly pearl-ash, usually with no markings except an oblique line of venular dots in the outer third of wing, and a row of minute marginal intervenular dots. Fringe concolorous with the wing. Hind wings with the same markings. Sometimes the four discal small round dots are present. Under side of wings exactly like the upper. Discal dots minute, the row of dots wanting, the marginal row present. A double row of dorsal spots, sometimes wanting, sometimes conspicuous. Legs a little paler than the body.

Length of body, ♂, 0.35–0.45, ♀, 0.37; of fore wing, ♂, 0.52–0.60, ♀, 0.55; expanse of wings, 0.75–1.20 inches.

Brunswick, Me. (Packard); Maine (or Connecticut?), (S. I. Smith, Mus. Yale College); Natick, Mass., May 26 (Stratton); Malden, June 1, Cambridge, Mass., July 30 (H. K. Morrison); Philadelphia, Pa. (Ent. Soc.).

This species varies much in size and markings. It is usually pearl-ash, having a lilac tinge, sometimes thickly dusted, and then wanting the outer row of dots. In the female, there is a very faint shade just beyond the discal dot on both wings. The discal dots are often wanting. In a small individual from Pennsylvania, there are two rows of black dots, the inner just within

the discal dot, being a transverse shade on the hind wings, while the specimen is deeper pearl-ash than the others, being in a better state of preservation.

The species may be known by the uniform pearl-ash color, and the want of the usual speckles and dentate lines, and by the short slender tibiae and remarkably long tarsi. Our specimen agrees well with Hübner's figure.

TEPHROSIA CALIFORNIARIA Packard. Plate 11, fig. 15.

Tephrosia californiaria Pack., Proc. Ent. Soc. Nat. Hist., xiii, 388, 1871.

♂.—This species belongs to the same group as *T. canadaria*, but the wings, fore and hind, are shorter and broader; otherwise the head, antennae, and form of the body are the same. Reddish ash, fore wings a little deeper reddish, thickly speckled with dark scales, with three diffuse, dusky, indistinct, brown lines; the basal, on the inner fourth of the wing, curved, angulated on the submedian vein, and sinuate just below the median vein; the middle line is situated just beyond the discal dot, and is slightly oblique, sinuate, and connected with a large dusky cloud inclosing the discal dot, and sending a diffuse line to the costa and internal margin of the wing. Half-way between the discal dot and the outer edge of the wing is a broad scalloped line deepening in tint toward the points of the scallops; a larger scallop than the others rests on the inner edge of the wing; just below the middle of the wing are two large twin scallops and two larger than the others near the apex, there being eight scallops in all. A row of black dots along the edges of both wings; fringe concolorous with both wings. Discal dot on fore wings minute, black, surrounded by a white round spot. On the hind wings, three faint diffuse lines start from the inner edge, disappearing in the middle of the wing. Beneath clear pale ash; discal dots distinct, costal and outer edge speckled with black scales. Varies in size and distinctness of median cloud on fore wings, and of the short lines on hind wings.

Length of body, 0.50; fore wing, 0.57–0.64; expanse of wings, 1.30 inches.

California (Behrens); Southern Nevada (Crotch, Mus. Comp. Zool.).

It varies a good deal in the distinctness of the bands, and may be recognized by the white discal spot pupiled with black, and the interrupted heavy submarginal row of spots.

TEPHROSIA FALCATAIA Packard. Plate 9, fig. 67.

Tephrosia falcataia Pack., Bost. Soc. Nat. Hist., xxi, pl. 1, fig. 7, 1874.

1 ♂.—This species has remarkably falcate wings, the tip of the fore wings being acute, the costa being more bent down at the tip, and the outer edge excavated much deeper than usual; the costal area is wider, hence the four subcostal venules are shorter than usual, but their mode of branching off is the same. Antennae well pectinated, dark brown, as usual, contrasting with the rest of the body. Head, thorax, and fore wings pale reddish fawn-color; hind wings and abdomen much paler, much more whitish than in the other species. Fore wings very uniformly reddish fawn, with no conspicuous bands or rows of spots, and remarkably few scattered dark scales, the wings in all the other species known to me being more or less densely dusted. Discal dot small, black; a submarginal row of about six obscure dusky spots, arranged in a straight line parallel to the outer edge. A marginal series of black venular points. Fringe deeper reddish than wing itself. Hind wings almost whitish fawn, unusually clear, with a few faint, scattered, dark scales; a dark discal dot; fringe reddish, concolorous with that on fore wings; no other markings on the wing. Beneath, both wings alike, a little less pale than hind wings behind, but tinged with reddish on the edges, and more speckled. Discal dot and marginal row of dots as above. Fringe darker than rest of wings. Hind wings a little more dusted than primaries. Discal dot much larger and more conspicuous than above. Abdomen not spotted.

Length of body, 0.50; fore wing, 0.64; expanse of wings, 1.30 inches. California (Edwards).

It may be known by its unusually falcate primaries, its clear wings free from the usual bands and scales, and by its reddish hue.

TEPHROSIA ANTICARIA Walker. Plate 11, fig. 12.

Tephrosia anticaria Walk., List Lep. Het. Br. Mus., xxi, 404, 1869.

Tephrosia subauraria Walk., List Lep. Het. Br. Mus., xxi, 406, 1869.

3 ♂ and 3 ♀.—Of medium size, with the apex of the wings subrectangular and the outer edge less oblique than usual. Dull ash-gray; both wings of the same hue. Head brown in front, with a white hair-streak on the anterior edge; vertex dull ash-gray; male antennae ciliated. Fore wings with three black heavy lines more or less broken up into spots; they are regularly

curved, parallel and equidistant, and slightly enlarged on the costa, below which they are bent a little. The middle line is sometimes nearer the inner than the outer. A submarginal, broken, whitish line, shaded with dark gray, sometimes obsolete. Hind wings with two blackish lines, the outer sinuous toward the inner edge. The submarginal line is as on the fore wings. Beneath, a little paler than above; the discal dots are large and conspicuous on both wings, not being present above, while the inner line is represented by a costal spot. The extradiscal line is distinct and common to both wings. The submarginal line is represented by a short line, which extends from the costa to near the middle of the wing. The abdomen has a median row of white spots.

Length of body, ♂, 0.45, ♀, 0.40; fore wing, ♂, 0.50, ♀, 0.50; expanse of wings, 1.00 inch.

Natick, Mass., July 17 (Stratton); Massachusetts (Morrison).

This species is rather obscurely marked, but may be distinguished by the simple male antennae, the dull gray wings mottled obscurely with white scales, and by the three, heavy, dark, parallel, slightly-curved lines on the fore wings, the middle one absorbing the discal dot.

TEPHROSIA CRIBRATARIA Guenée. Plate 11, fig. 13.

Tephrosia cribrataria Guen., Phal., i, 260, 1857.

Walk., List Lep. Het. Br. Mus., 492, 1860.

3 ♂.—Antennae strongly pectinated, much more so than in *T. canadaria*; the extreme tip simple. Wings much as in *T. canadaria*, but the hinder pair less notched in the middle of the outer edge. Body and wings whitish-gray, the latter thickly speckled with pale brown. Fore wings with three conspicuous, costal, dark spots, the distance between the inner two half as great as between the second and third; from the inner two spots, two faint sinuous shades cross the wing. A slender, faint, pale, discal dot. Outer line consisting of a sinuous row of venular, conspicuous, black dots; the line straight from the costa to the first median vein, thence curving inward. Beyond, a broad, faint, brownish shade. A marginal row of black dots. Hind wings with two large black dots near the base, one on the inner edge, the other near the middle of the wing. Outer line of dots sinuous. Wing beyond as in anterior pair. Fringe whitish. Beneath, pale whitish, with no markings, except the faint discal dots and a marginal row of dots on both

wings. Fore legs brownish externally. Hind tibiae rather long and full; tarsi of the average length, being much longer than in *T. canadaria*. Abdomen with two rows of conspicuous black spots.

Length of body, ♂, 0.50; of fore wing, ♀, 0.65; expanse of wings, 1.25 inches.

Massachusetts (Sanborn): New Salem, N. H. (J. N. Trask, Coll. Bost. Soc. Nat. Hist.).

This species may be known by the stoutly-pectinated antennae, the branches, in drying, interlocking somewhat at the end; by the conspicuous abdominal spots, and the outer row of black dots on both wings. The two inner costal spots are more distinct, while the lines are fainter than usual. The black dots are pointed, the line connecting them being really dentate. The marginal dots are more distinct than in the other species. It is a peculiar form and readily recognized.

Larva.—"The caterpillar is slightly attenuated anteriorly, of a gray-testaceous, with the back and the sutures of a deeper hue, and a wood-brown stigmatal line. The head is concolorous and profoundly divided into two points. There are two small tubercles on the 11th ring, the rest of the body without any eminence. It lives on the *Populus tremuloides* and *fastigiata*. The chrysalis is entirely black."—Guenée.

TEPHROSIA CANADARIA Guenée. Plate 11, fig. 14.

Tephrosia canadaria Guenée, Plak., i, 263, 1857.

Walk., Cat. Lep. Het. Br. Mas., 492, 1869.

Tephrosia canadaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 33, 1874.

12 ♂ and 3 ♀.—This is the largest species of the genus, and approaches *Cynatophora* more in its markings than any of the following species. It is characterized by the very long hind tibiae. Antennae less pectinated than in *T. cribrataria*; hind wings with a quite deep notch. Body and wings ash; wings thickly speckled with brown, often with a reddish-brown tint. Head with a transverse dark band in front of the antennae. Hind edge of the prothorax shaded with dark brown. Fore wings with three lines, the inner near the base, regularly curved (often almost obsolete); second line broad, diffuse, nearly touching the discal dot. Outer line somewhat sinuous, slightly scalloped, especially opposite the discal dot and on the submedian vein. Two black spots just outside the two lower scallops. A faint, submarginal white,

zigzag line, with the scallops filled in with large black spots; six more prominent, two subcostal, two extradiscal, from which a dusky shade is sent to the edge of the wing, and two at the anal angle; in the reddish-brown race, the line consists of a row of white dots, black within. Marginal row of black dots very distinct. Fringe concolorous with the wing. Hind wings as in the anterior pair; a broad, diffuse, faint band just within the conspicuous discal dot. The line beyond slightly wavy, not reaching the costa; otherwise the rest of the wing as in the anterior pair. Beneath, the veins subochreous, the surface more or less mottled, discal dots distinct, with a broad, diffuse, smoky, marginal shade on both wings. Abdomen not spotted above. Two fore pairs of legs alternately banded externally with black and ashen; hind legs pale; the tibiae very long, full, somewhat flattened, while the tarsi are unusually short.

Length of body, ♂, 0.55–0.70; of fore wing, ♂, 0.68–0.80; expanse of wings, 1.60 inches.

Brunswick, Me., Salem, Mass. (Packard); Brookline, Mass., July 11, Cambridge, Mass., July 7 (Shurtleff); Dorchester, Mass. (Sanborn); Hastings-on-Hudson, N. Y., Philadelphia, Pa. (Grote); Philadelphia, Pa. (Ent. Soc.); Pennsylvania (H. Edwards); near Mammoth Cave, Ky., May 3 (Sanborn, Ky. Geol. Surv.); New Orleans, La. (Mus. Peab. Acad. Sc.); California (H. Edwards and Behrens).

This common species may be at once known by its large size, the long, swollen, somewhat flattened, hind tibiae and short tarsi, and by the heavily-speckled fore wings and the heavy lines. The Californian examples do not differ from eastern ones.

There are two races: one brown-ash, with the wings thickly dusted, while in the other the wings are clearer and tinged with reddish-brown, while the submarginal row of white dots, with a black dot on the inner side, is quite conspicuous.

Tephrosia ferruginosaria Pack. (Proc. Bost. Soc. Nat. Hist., xiii, 388, 1871, xvi, pl. 1, fig. 21, 1874) is a variety of *Lozogramma nigroseriata* Pack. (originally described as a *Tephrosia*, Proc. Bost. Soc. Nat. Hist., xvi, 32, 1874).

CYMATOPHORA Hübner. Plate 5, figs. 3, 2*a*; Plate 6, fig. 23.

Cymatophora Hübner, Tentamen, 1-10.

Dipocertes, *Tetropas*, and *Dedeptonia* Hübner, Verz., 336, 1818.

Chora Curtis, Brit. Ent., 88, 1825.

Boarmia Treits., (in part), Schim. Eur., vi, i, 187, 1827.

Chora Steph., (in part), *Aleis*, and *Boarmia*, Nomencl. Br. Ins., 13, 1829.

Boarmia Dup., (in part), Lep. France, vi (ix), 327, 1829.

Boisd., (in part), Gen. Ind., 196, 1840.

Dup., Cat., 220, 1844.

H.-Sch., Schim. Eur., iii, 76, 1847.

Aleis and *Boarmia* Steph., Cat. Br. Lep., 173, 174, 1850.

Boarmia Lederer, Verh. Bot. Zool. Ges. Wien, 177, 1853.

Guen., Phal., i, 235, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 334, 1860.

Head broader in front than long, much broader than in *Tiphrosia*. Palpi usually short and broad, not reaching beyond the front; or slender, pointed, and reaching well beyond the front (*C. psilogrammaria*). Antennae well pectinated, but not plumose. Fore wings with the costa slightly convex, especially toward the subacute apex; outer edge very oblique, rather long, not bent. Hind wings either a little elongated toward the apex or well rounded, sometimes slightly scalloped. Venation: costal vein either anastomosing with the subcostal (*C. umbrosaria*) or free (*C. psilogrammaria*). Usually six subcostal venules (five in *C. psilogrammaria*). Usually no subcostal cell (*C. umbrosaria*); but it is sometimes present, as in *C. psilogrammaria*. Male hind legs only moderately long; hind tibiae much swollen, and tarsi about one-third as long as the tibiae (in *C. psilogrammaria* very long and slender, the tibiae not swollen, and the tarsi longer than the tibiae). Coloration: invariably whitish or dark gray, with three sinuous black lines, often double.

The species of this genus are numerous and widely distributed, like those of *Tiphrosia*, occurring in deep, dark woods. They are distinguished by their peculiar style of coloration, being, when unrubbed, dark slate-gray, and after flying about a few days becoming whitish-gray, and also by the broad front, heavily-pectinated antennae, usually short palpi, and convex costa of the fore wings. Contrary to what may be regarded as convenient, I follow the strict law of priority, and adopt Hübner's name *Cymatophora* for this genus, dropping *Boarmia*, which is in common use. Even were *Cymatophora* not adopted, one of Hübner's other terms, *Dipocertes* or *Dedeptonia*, would have to be used, as they are well-defined groups, nearly as much so as Treitschke's *Boarmia*, while he had no right to transfer the name *Cymatophora* to a genus of another family (*Noctuida*).

Larva.—Caterpillars ramiform, rigid, elongated, of equal size throughout, adorned with lateral tubercles; head flattened in front, and as broad as the prothoracic ring. Living on the leaves of trees, and rarely on low plants. Chrysalids in small subterranean cocoons.

Synopsis of the Species.

A. Antennæ pubescent :

Pale ash; outer line dentate *C. crepuscularia*.

B. Antennæ broadly pectinated :

a. Wings long and narrow :

Diminutive; pale ash; with three very distinct black lines..... *C. psilogrammaria*.

b. Wings long; hind wings notched :

Outer line straight, beyond reddish-brown..... *C. plumosaria*.

c. Fore wings acute, with five straight, parallel lines :

Hind edge of abdominal rings black and white *C. 5-linearia*.

C. Antennæ usually narrowly pectinated; terminal third filiform ;

wings long; discal ringlets elongated :

Outer line on the fore wing slightly sinuous, with a subcostal tooth;
beneath a broad submarginal shade *C. pampinaria*.

Outer line on the fore wing very sinuous; a shallow subcostal scallop;
beneath no well-marked submarginal shade..... *C. humaria*.

Outer line angulate, sinuate; a great angle in the extradiscal space;
discal dots beneath large and diffuse; outer line on hind wing
with a great angle..... *C. larraria*.

Markings much as in *humaria*, but outer edge of hind wings fuller, more
distinctly scalloped, and discal dot not annular, as in *larraria* and
humaria..... *C. polygrammaria*.

Wings short and broad; very dark, discal dot on hind wings, round,
not oblong-oval; lines on fore wings not very oblique; antennæ
plumose *C. umbrosaria*.

Hind wings deeply scalloped; a very distinct dark line common to both
wings; the largest species of the genus *C. californaria*.

CYMATOPHORA CREPUSCULARIA Packard. Plate 11, fig. 24.

Boarmia crepuscularia Treits., Schm. Eur., vi (i), 190, 1827.

Tephrosia crepuscularia Guen., Phal., i, 264, 1857.

Tephrosia occiduaris Guen., Phal., i, 266, 1857.

Boarmia sublanaria Walk.!!!, List Lep. Het. Br. Mus., xxi, 345, 1860.

Boarmia signaria Walk.!!!, List Lep. Het. Br. Mus., xxi, 346, 1860.

Tephrosia spatiosaria Walk.!!!, List Lep. Het. Br. Mus., xxi, 403, 1860.

Tephrosia tatararia Walk.!!!, List Lep. Het. Br. Mus., xxi, 403, 1860.

Tephrosia fumataria Mmol!!!, Proc. Bost. Soc. Nat. Hist., xiii, 84, 1869.

12 ♂ and 4 ♀.— Closely allied in the form of the wings and the markings to *C. umbrosaria*, differing in the antennæ being simply pubescent. Body and wings whitish-ash, finely and uniformly dusted with brown. Head whitish,

with a blackish band in front of, and another between, the antennae. Palpi black on the sides, whitish below and at tips. Thorax with a dusky shade on hind edge of prothorax, and a transverse dusky band behind the middle. Fore wings with three curved, dentate, black lines, marked by distinct black points on the veins. The inner line regularly curved, well marked on the costa, bent outward a little just below this spot, enlarging into a round black spot on the median vein. Middle line faint, brown, somewhat diffuse (often obsolete), and much less curved than the inner line, with a distinct costal patch; third and outer line sinuate, not much curved, with a series of black dots produced along the veins into teeth; a double tooth on the origin of the first median vein. This line is accompanied by a broad, faint, pale, brown shade. A submarginal row of diffuse, large, dusky spots, best marked toward the apex, and these spots filling the teeth in the submarginal zigzag white line; two dark scallops conspicuous in the extradiscal interspace. Marginal row of black lunules, sometimes forming rounded dots. Fringe whitish on both wings. Hind wings with three wavy lines, the inner just within the discal dot (no discal dot on fore wings) and broader than the others, while the middle line is more distinctly dentate than on the fore wings. Wing beyond marked as on the anterior pair. Abdomen with a double row of dorsal black spots. Beneath, either uniformly pale ash, and without any markings, except very faint discal dots and an outer line, or quite uniformly mottled with dusky ash, and with two lines faintly reproduced. Fore legs dusky, ringed with whitish; hind legs pale ash; hind tibiae as usual in the other species.

Length of body, ♂, 0.50–0.60, ♀, 0.60; of fore wing, ♂, 0.65–0.72, ♀, 0.75; expanse of wings, 1.50–1.60 inches.

Salem, Mass., July 13 (Emerton and Packard); Cambridge, July 7, Brookline, October 4 (Shurtleff); Boston (Minot); Dorchester, Mass. (Sanborn); West Farms, N. Y. (Angus); Brewster's, N. Y., April 21 (Grote); Albany, N. Y., May 4 (Lintner); Illinois (Dr. Hoy); Philadelphia, Pa. (Ent. Soc. and Grote).

It varies in the distinctness of the lines, the second line on the fore wings is often wanting, and sometimes the lines are quite heavy. The specks, usually light, are sometimes abundant, making the wings darker than usual. The species does not differ in any particular from *C. crepuscularia* from Europe. In comparing a Vienna male with fourteen others, from different parts of the United States, I do not find so much difference as

between some taken in our own country; there are not even any climatic or racial differences that I can perceive. It is our most common species, and is found in boreal and middle Europe. It may be known by the simply pubescent antennae, its pale color, the outer dentate line, that on the fore wing less sinuous than the corresponding line in *C. umbrosaria*.

The European *Tephrosia consortaria* is a true *Cymatophora*, and larger than, but closely allied to, *crepuscularia*.

CYMATOPHORA PSILOGRAMMARIA Packard. Plate 11, fig. 16.

Psarmia psilogrammaria Zeller!!!, Verh. Bot. Zool. Ges. Wien., xxii, 1872.

3 ♂ and 6 ♀.—This pretty, diminutive species is whitish-ash in color, and has long, narrow fore wings, with the apex much rounded, though somewhat produced, and with the outer edge nearly as long as the inner. Male antennae heavily pectinated. Fore wings with three distinct, scalloped, black hair-lines, and two diffuse, faint lines beyond, common to both pairs of wings; midway between the insertion of the wing and the basal line is a black costal spot; basal line very oblique, arising near the middle of the costa and ending at the same distance from the insertion of the wing as the first costal spot; the line is jagged, with a large angle below the costa; beyond the discal dots are two parallel, scalloped, black hair-lines, curved outward opposite the discal dot, and still beyond are two smoky, diffuse, wavy bands; the marginal row of black, elongated dots is very distinct. Hind wings quite clear, with a line running as far as the discal dot, and, beyond, two black lines, the outer the most distinct; beyond are two obscure, smoky lines, as in the fore wings; the dots on the margin are round, and remote from each other; beneath, the wing is clear and pale, with the discal dots distinct, and with traces particularly of the outer line, on both wings. The fore legs are blackish.

Length of body, ♂, 0.30, ♀, 0.30; of fore wings, ♂, 0.40, ♀, 0.45; expanse of wings, 0.85–0.95 inch.

Texas, May 7–11 (Belfrage).

This appears to be a common species in Texas, but has not yet occurred elsewhere. It may be recognized by its small size, the clear, whitish wings, and the scalloped fine, clear, dark lines. I have examined Professor Zeller's type in the Museum of Comparative Zoölogy.

CYMATOPHORA PLUMOSARIA Packard. Plate 11, fig. 17.

Cymatophora plumosaria Pack., Sixth Rep. Peab. Acad. Sci., 51, 1874.

2 ♂.—This species belongs to a distinct section of the genus, and is intermediate between *C. humaria* and *C. umbrosaria*; the antennae being broadly pectinated, plumose to just before the tip, the branches being rather longer than in *C. umbrosaria*, while the wings are shaped somewhat as in *C. humaria*. The lines are straight, not waved, and bent, and in this respect it resembles *Homocophila*. The hind wings are distinctly notched on the independent vein. Front dark brown, with a white line in front. Vertex whitish. Body and wings dull ash. Fore wings with brownish scales at the base of the wing and beyond the outer line; three black lines, the inner much curved, obliquely curved on the costa, and from the median vein directed obliquely and ending nearer the base of the wing than usual; middle of the wing paler than elsewhere; a faint discal dot; middle line sinuate, approaching the outer line just below the median vein; outer line very distinct, bent at right angles below the last (sixth) subcostal vein, and thence to the inner edge very oblique and not curved; beyond, the wing is reddish-brown, inclosing a zigzag, white, submarginal line; a marginal row of black dots. Fringe concolorous with both wings. Hind wings like the fore wings, with two black lines, the inner diffuse, straight, not reaching the costa, the outer more distinct, curved round opposite the distinct discal dot to the costa, but directed straight to the hinder edge; beyond, reddish-brown, and marked as in the fore wing. Abdomen with a faint black line at the base, and the hind edge of the segments touched with black. Beneath, both wings uniformly ash, with a faint ochreous tinge on the veins and the costa, but no lines, and the discal dots distinct (or very faint and diffuse). The marginal row of venules sometimes distinct. Fore legs dark within, paler externally. Hind legs pale.

Length of body, ♂, 0.53; of fore wing, ♂, 0.53; expanse of wings, 1.08 inches.

Demopolis, Ala. (Grote).

This interesting species may be known by the very plumose antennae, the straight outer line and reddish-brown margin of the wings, the simple discal dots, and by the notch, or sinus, in the hind wings.

CYMATOPHORA QUINQUE-LINEARIA Packard. Plate 11, fig. 18.

Cymatophora 5-linearis Pack., Sixth Rep. Peab. Acad. Sc., 51, 1871.

2 ♂ and 1 ♀.—In this species, the body is unusually stout, the antennae broadly pectinated, a little less so than in *C. plumosaria*, and the tip is simple, the simple portion longer than in *C. plumosaria*; the wings are longer and apex more acute than in any other species. Apex of the hind wings more produced than usual. Body and wings pale whitish-ash. Head brown, a white line on the front edge, between and behind the antennae whitish; base of the head next to the prothorax brown. Thorax white; prothorax brownish. Fore wings pale ash, with fine, parallel, black lines, very oblique and not curved, all apparently not reaching the costa. Inner line double, broad, ending on the inner edge half-way between the base of the wing and the third line; second, third, and fourth close together; second very narrow; the third broad and more distinct than any others; the fourth forming a broad shade parallel and close to the third; the fifth is more parallel to the margin. Discal dot round, distinct. Hind wings with five lines, all disappearing before the costa; the inner diffuse and a little curved, the second the most distinct and ending on the discal dot, which is merged with it; the three beyond are diffuse bands, the outer forming the margin of the wing, and twice as wide as the fourth. Abdomen with the segments edged with white, with an inner black streak. Legs ash; fore pair a little dusky within. Beneath uniformly dull ash, with no lines and very faint discal dots.

Length of body, ♂, 0.45, ♀, 0.42; of fore wings, ♂, 0.58, ♀, 0.52; expanse of wings, 1.25 inches.

Texas, March 7, April 28, May 13 (Belfrage).

This singular species may be readily recognized by the broadly-pectinated antennae, the pointed fore wings, the five parallel straight lines, though oblique in their course, and the alternating white and dark linear bands on the abdomen.

CYMATOPHORA PAMPINARIA Packard. Plate 11, fig. 20.

Boarmia pampinaria Guen., !!!, Phal., i, 215, 1857.

Walk., !!!, List Lep. Het. Br. Mus., xxi, 312, 1860.

Boarmia fragaliaria Guen., Phal., i, 216, 1857.

Boarmia fraudulentaria Zeller, !!!, Verh. Bot. Zool. Ges. Wien, xxii, 492, 1872.

12 ♂ and 4 ♀.—Antennae moderately pectinated. Palpi pale gray, blackish on the sides, white at the tip and on the under side of the basal

joint. Head dark in front, pale on the vertex, a few dark scales between the insertions of the antennae. Body and wings pale ash; both wings somewhat produced toward the apex. Fore wings speckled with brown scales, a large blister at base; three prominent lines, the inner broadly curved, the curve continuing across the median space, the line heavy and black, subauctory, angulated outward below the costa, broadening on the costa and on the median vein, and angulated outward slightly on the submedian; it is distinctly prolonged on to the base of the hind wings. The second or middle line begins as a broad triangular costal patch, larger than that of the basal line, and curved around just outside of the simple discal dot (which seems, however, to form one side of a ringlet, of which the outer two-thirds are formed by the curve in the line). The line widens at the origin of the first median venule, where it approaches the outer line; it touches it just below the second median and then diverges on to the inner edge. The line is slightly scalloped. Outer line black, distinct, broadly sinuous, with three grand curves; between the costal edge and the last subcostal venule three unequal teeth, the largest and most acute just below the costa; below it and at the base a point on the second venule; from the third tooth the line sweeps around continuously to the third median venule, with a black point on each venule; below this the line curves regularly inward, pointed outward on the submedian vein; a dull-brown, almost blackish, shade borders this line. A submarginal, zigzag, distinct, white line, the scallops within filled with black. From each white point a narrow dark streak connects with each black inter-venular dot. A dark shade in the extradiscal interspace. Fringe on both wings gray, faintly checkered with paler opposite the black dots. Hind wings pale within the extradiscal line; at the extreme base a black line; a straight shade just below the discal dot, which is black, linear, distinct. The third is narrow, black, distinct, nearly straight, pointed slightly outward on the costal vein, and with a very prominent tooth on the first subcostal vein; between the median vein and the inner edge a little curved inward. Beyond is a brown shade. A broad, submarginal, dusky shade, inclosing a zigzag, white line. A black, marginal, scalloped line. Beneath pale-ash, with a very faint ochreous tint; discal dot on the fore wing three times as large as on the hind wings; middle area of the fore wings smoky. A very broad marginal blackish shade, leaving a whitish apex, and the adjoining portion of the fringe paler. On the hind wings, the shade is narrower, disappearing at the inner

angle of the wing, and leaving the edge of the wing pale. Both wings mottled with rather broad transverse streaks. A distinct black band at the base of the abdomen; the hind edges of the second and succeeding segments dusky; the basal segment unusually white. Anterior pair of legs dusky, with narrow paler rings; hind femora thick, pale, with a pencil of hairs, as usual. The female is larger, a little more dusky above and beneath, but with the same markings.

Length of body, ♂, 0.53–0.55, ♀, 0.42; of fore wing, ♂, 0.58–0.65, ♀, 0.75; expanse of wings, 1.40–1.55 inches.

Maine (Packard); Lausing, Mich. (Miles); Natick, Mass., June 28 (Stratton, Coll. Bost. Soc. Nat. Hist.); Albany, N. Y. (Lintner and Meske); Brewster's, N. Y. (Grote); Philadelphia, Pa. (Ent. Soc.); Pennsylvania (Mus. Comp. Zool.); West Farms, N. Y. (Angus); Demopolis, Ala. (Grote); Texas, March 12–20, May 12, July 11–19, August 19–30 (Bellfrage); Glencoe, Dodge County, Nebr. (Dodge).

This is perhaps our most common and widely-distributed species. It may be known by the very distinct line at the base of the abdomen, the basal ring beyond being unusually white, and by the under side of the wings having a broad marginal shade, while the third line on the fore wing is deeply but quite regularly sinuate, and near the costa acutely dentate, while in *C. hamaria* it is instead obtusely curved. It varies a good deal, especially in the tint of the brown shade accompanying the third line. It does not apparently vary much in size. I find specimens agreeing mainly with *B. frugaliaria* Guen., having the cannel-coal-colored band, while the discal dot is variable in all the specimens, and I have examples in which it almost touches the median line. In a specimen received from Mr. Angus, the basal line is double, arising from two costal spots, and uniting on the inner edge of the wing.

A single female specimen collected by myself at Idaho, Colo., July 5, at light, may prove to be the type of a distinct species. It differs from the eastern females of *pampinaria* in the want of any basal black line on the second pair of wings, the corresponding line at the base of the abdomen not being present. The basal line on the fore wings ends much farther from the insertion of the wing, while the extradiscal line is scalloped very distinctly; otherwise it does not materially differ from a typical *pampinaria*. It expands 1.50 inches.

Larva.—Mr. L. W. Goodell, of Amherst, Mass., has reared the moth from larvae feeding on the pear-tree. He writes me that "when fully grown it measured one inch in length and was of a pale yellowish green color, with a broad reddish brown stripe edged with black on the back, and on each side of the fifth ring was a small black spot. September 1th, after spinning a few threads over itself it became a pupa, and was transformed to a moth November 14th. The pupa was one-half an inch long, and light brown in color."

CYMATOPHORA HUMARIA Packard. Plate 11, fig. 22; larva, plate 13, fig. 15.

Boarmia humaria Guen., Phal., i, 246, 1857.

Boarmia intraria Guen., !!!, Phal., i, 246, 1857.

Boarmia deficiaria Guen., Phal., i, 247, 1857.

Boarmia momaria Walk., !!!, List Lep. Het. Br. Mus., xxi, 345, 1860.

Boarmia humaria Walk., !!!, List Lep. Het. Br. Mus., xxi, 342, 1860.

Boarmia intraria Walk., List Lep. Het. Br. Mus., xxi, 343, 1860.

Boarmia transfararia Walk., !!!, List Lep. Het. Br. Mus., xxi, 347, 1860.

Boarmia albipinnaria Walk., List Lep. Het. Br. Mus., xxi, 345, 1860.

Boarmia sphyrapia Walk., !!!, List Lep. Het. Br. Mus., xxi, 349, 1860.

Boarmia intractaria Walk., !!!, List Lep. Het. Br. Mus., xxi, 349, 1860.

Phalaapteryx crosata Walk., !!!, List Lep. Het. Br. Mus., xxvi, 1748, 1862.

? *Boarmia lorrana* Walk., List Lep. Het. Br. Mus., xxi, 341, 1860.

9 ♂ and 4 ♀.—Antennae of the male moderately pectinated about three-quarters their length; tip filiform. Body and wings whitish-ash, moderately dusted with brown scales; paler, however, than in *C. pampinaria* G. Head light, a broad, transverse, black band on the anterior edge of the front, and a narrower one between the antennae. A distinct, light-brown band on the prothorax, and some concolorous scales on the scutellum. Both wings longer, more produced toward the apex than in *C. pampinaria*, the outer edge of the fore wings being more oblique. End of the abdomen just even with the anal angle of the hind wings. Fore wings with the basal line much less curved than in *C. pampinaria*, and ending farther from the base of the wing; a double tooth on the costa, the upper being a broad, costal, black spot, while below is a well-marked tooth; another tooth on the median vein; the line is broadly shaded internally with pale chocolate-brown; the middle line usually indistinct, except on the costa; it is sinuate, subparallel with the outer line; it curves around outside the narrow, long, discal ring (sometimes appearing to pass through the outer side of the ring; it varies in its distance from the outer line, usually joining it on the submedian vein, and leaving a more or less well-marked v-shaped area on the inner edge of the wing; outer (third) line black, distinct, very sinuous; between the

costa and extradiscal space the line is straight and divided into two shallow scallops, the lower being the more pointed of the two (in *C. pampinaria* the upper scallop is represented by a prominent double tooth); below, the line curves inward, with a similar outward curve, and then the line curves outward, ending on the inner edge of the wing; a broad, pale, chocolate-brown shade borders the line externally; the usual distinct, zigzag, white line inclosed in a dusky area; a whitish subapical patch; a row of marginal, small, round dots, each dot sending a faint black streak inward. Fringe concolorous with the wing, not checkered. Hind wings with a black line at the extreme base (sometimes wanting); middle line broad, diffuse, straight; outer line linear, with a distinct point opposite the discal dot in the more typical form, or the point obscure; the line varies in its distance from the narrow, large, discal ringlet; the line shaded beyond with pale chocolate; submarginal zigzag line and edge as in the fore wings; beneath, usually with no markings, except three faint costal spots, and discal spots and marginal spots. Surface of both wings uniformly dusky-ash, a little darker than in *C. pampinaria*; in one specimen, a faint submarginal dusky shade. Abdomen with a narrow black stripe at the base, but the basal ring not conspicuously white, as in *C. pampinaria*; two rows of dorsal black spots along the abdomen. Anterior legs grayish, with paler rings.

Length of body, ♂, 0.50–0.55, ♀, 0.50; of fore wing, ♂, 0.60–0.70, ♀, 0.70; expanse of wings, 1.40–1.50 inches.

Brunswick, Me. (Packard); White Mountains, N. H., late in August (Seudder); Natick, Mass. (Stratton, Coll. Bost. Soc. Nat. Hist.); Lansing, Mich. (Miles); Iowa, July 28 (Parker); West Farms, N. Y. (Angus); Albany, N. Y. (Lintner and Meske); Brewster's, N. Y. (Grote); Philadelphia, Pa. (Ent. Soc.); Texas, May 6–15, July 8, August 3 (Belfrage).

This variable species is nearly as common as *C. pampinaria*, and differs from it in the very sinuous outer line, the more oblique, less curved, inner line of the fore wing, by the distinct discal ringlets on both wings, and by the absence beneath of the submarginal dusky shade. Walker's *Phibalapteryx crosiata* is a rubbed individual, with very broad, suffused, black lines. I have it from Maine. Another variety, which I did not see either in M. Guenée's collection or that of the British Museum, is chocolate-ash, with the chocolate bands twice as broad as usual.

M. Guenée tells me that his *B. momaria* is from Australia, not North America.

I can find no character of importance in M. Guenée's description to separate his *B. defectaria* from *humaria* and *larraria*. One of my specimens of *humaria* has a faint dusky "baede subterminale", and the variations in size are quite marked in this species, though less so than in *B. larraria*. Walker's description of *B. larraria* applies in the main to this species, except that the expression "under side (of fore wings) with an elongated blackish spot" is scarcely applicable, though this may refer to the faint dusky shade noticed in one of my specimens; at all events, it is not the *B. larraria* of Guenée.

In a specimen from Texas, the discal ringlet of the hind wing touches the outer line, which is much more angulated than usual.

Larva and pupa.—Body rather thick, smooth, not humped; reddish-brown above and straw-yellow beneath; head yellowish, spotted with brown. Pupa (pl. 13, fig. 15*a*) of the usual conical form, reddish-brown. Food-plant, an *Acacia*-like genus.—(Described from Abbot's MS. drawing.)

Fig. 21, of plate 13, represents a caterpillar drawn by Abbot. On the same plate is a moth closely allied to *C. humaria*. It is probably the larva of some Eumoniine genus. The body is cylindrical, ramiform; head rather small, with a fungus-like dorsal hump just before the middle of the body and a smaller terminal one. Head, humps, feet, and anal segment reddish. Body grass-green, with a transverse, pale, dorsal band on each segment. Pupa slender, umber-brown. Food-plant *Rhexia mariana*.

CYMATOPHORA LARVARIA Guenée. Plate 11, fig. 21.

Boarmia larraria Guen., Plal., i, 247, 1857.

Boarmia humaria Walk., List Lep. Het. Br. Mus., xxi, 342, 1860.

Boarmia defectaria Walk., List Lep. Het. Br. Mus., xxi, 343, 1860.

Not *Boarmia larraria* Walk., List Lep. Het. Br. Mus., xxi, 344, 1860.

♂ and ♀.—Fore wings still more produced toward the apex than in *humaria*. Male antennae pectinated as in that species. Tip of abdomen projecting a little beyond the hind wings. Pale whitish-ash; head whitish; a few black scales between the antennae. A brown line on the prothorax. Fore wings with the inner line broad on the costa, angulated below, and thence going obliquely, not much curved, to the inner edge, bordered within with a pale-brown shade. Discal ringlet broader than in *B. humaria* and

more distinct. Middle line making a right angle opposite the discal ring, broad on the costa, below the median vein parallel with the outer line, and not touching it. Outer (third) line very sinuous, with a large rectangular bend opposite the discal ring; the line curves inward to the point of the angle, which is either square and subdentate, or rounded; another prominent bend just below the third median venule, where the line is deeply curved inward. The line usually bordered externally with pale chocolate-brown (though not always). The usual zigzag, submarginal, white line inclosed in a black shade, or both partially obsolete. Marginal row of dots as usual. Hind wings with a broad, black, inner line, usually double and often touching, and in one case inclosing the discal ringlet. Outer line with a great subacute angle opposite the discal dot, and thence following a deep regular curve to near the anal angle. Beyond as in the fore wings. Abdomen with a black line at base, beyond not spotted. Beneath pale, with the discal dots very large and diffuse; a submarginal, broad, dusky shade, sometimes not extending beyond the middle of the wing. The outer line is faintly reproduced.

Length of body, ♂, 0.40–0.60, ♀, 0.50; of fore wing, ♂, 0.55–0.73, ♀, 0.65; expanse of wings, 1.30–1.50 inches.

London, Canada, July 12 (W. Saunders); Brunswick, Me. (Packard); Portland, Me. (E. S. Morse); White Mountains, N. H., August 16 (C. A. Shurtleff); Holyoke, Mass. (J. E. Chase); West Farms, N. Y. (Angus); Albany, N. Y. (Meske and Lintner); Philadelphia, Pa. (Grote); Oregon (H. Edwards). The specimen from Oregon is rubbed, but not distinguishable from the large pale race.

This common species seems to be divided into two races, one smaller and darker, with the antennæ more broadly pectinated, while the outer line on the hind wing is less angulated, but it is difficult to draw a line between them. The species may at once be known by the very sinuate outer line on the fore wings, and the great angle in the corresponding line on the hind wings.

A striking variety received from Mr. Meske has darker wider lines than usual, the inner line on the hind wings double and very heavy and broad, and inclosing the discal ringlet, while the outer line is but slightly angulated.

Larva.—Head of larva smooth and rounded, much as usual. Larva dull red, on wild cherry June 26; imago July 8. Pupated June 25; imago appeared July 12, brown, of the usual shape and color (Saunders). The moth reared by Mr. Saunders belonged to the small race.

CYMATOPHORA POLYGRAMMARIA *sp. nov.* Plate 11, fig. 19.

2 ♂.—This species is closely allied to *C. humaria*, but it is a little larger, and the apex of the fore wings is rounder, the outer edge a little more oblique, while the outer edge of the hind wings is decidedly fuller and more distinctly scalloped. The body and wings are clearer white than in *humaria*, and of much the same tint as in *larraria*. The basal line on the fore wings is more curved, less oblique, and not accompanied by a brown line as in *humaria*. A median, narrow, dark hair-line absorbs the discal dot. The arrangement of this and the extradiscal line much as in *humaria*. Extradiscal line much more oblique and less deeply sinuous than in *humaria*, and accompanied beyond by a dusky but not brown shade. The usual submarginal zigzag broad line. The marginal scalloped black line is very distinct, much as in *larraria*. Hind wings with an inner straight line; a small, black, elongated, discal dot, not annular, as in *humaria* and *larraria*; beyond is the extradiscal line, less angular than in *larraria*; beyond this line, marked as in the fore wings. Beneath white, the hind wings clear, not lineated; the fore wings white, but a little dusky. Discal dots present on both wings. The head is pale on the vertex, brown in front, and the abdomen is whitish, banded above with black transverse lines, with a pair of twin black spots on the white pencil of the hairs.

Length of body, ♂, 0.53; fore wing, ♂, 0.75; expanse of wings, 1.60 inches.

Amherst, Mass. (L. W. Goodell); Boston, Mass. (Sanborn); Cambridge, Mass. (Harris Coll.); New Jersey (Sachs).

This fine species is whiter than usual, with the lines arranged as in *larraria*, but without the fawn-brown bands of that species, and with the outer edge fuller and more distinctly scalloped, while the discal dot on the hind wings is not annular, being a simple dark spot.

CYMATOPHORA UMBROSARIA Hübner. Plate 11, fig. 23.

Cymatophora umbrosaria Hübner, Exot. Schm., i, 1806.

Boarmia gnopharia Guen., Plod., i, 251, 1857.

Boarmia umbrosaria Guen., Plod., i, 251, 1857.

Boarmia umbrosaria Walk., List Lep. Het. Br. Mus., xxi, 350, 1860.

Boarmia gnopharia Walk., List Lep. Het. Br. Mus., xxi, 350, 1860.

12 ♂ and 4 ♀.—Body stout; wings short and broad; fore wings triangular; hind wings short, rounded, and not reaching beyond the tip of the abdomen. Male antennae very broadly pectinated, speckled with white and

black above: in the female, simple, dark granite-gray, almost blackish. Front of the head blackish: a white cross-line just below the antennae: vertex with white scales. Palpi blackish on the sides, white on the under side of the basal joint, and at the tip of the second, and on the whole of the third. Fore wings thickly peppered with black scales, so that the three lines are quite indistinguishable: inner line angulated broadly, just below the costa broad, diffuse, and ending in a clear black costal spot, as do the three outer lines. Middle line subparallel, the angle opposite the discal spot, which consists of an obscure ring (represented in rubbed specimens by a large discal oval dot). Outer line a little more than half-way from the inner line to the outer edge of the wing: it is straighter than usual, curved quite regularly opposite the discal ring, scalloped slightly on the lower half, the scallops acutely pointed on the costal half (in worn specimens the line is represented by a series of black venular points). A submarginal line of acute scallops edged externally with white (the white line broader in worn specimens). From each point of these scallops, a broad, black, transverse, short stripe connects with the marginal row of narrow lunules. Fringe on both wings concolorous with the wing, paler externally. Hind wings as the anterior pair: basal line unusually broad, diffuse, varying in distance from the discal ring. Extradiscal line deeply scalloped: outer or third line margined with white: a row of faint dashes proceeding outward from the points of the scallops and connecting with the narrow marginal black lunules. Wings beneath pale dull gray, with fine, transverse, short streaks. Four very large, black, rounded, oval, discal spots. The third or outer line reproduced, being a row of black dots on the fore wing, situated half-way between the discal dot and the outer edge of the wing: on the hind wings nearer the discal dot: a broad, conspicuous, black, marginal shade on both wings: on the anterior pair the band widens toward the costa. Abdomen with no black line at base, with two rows of large, black, dorsal spots, those on the second and third segments large and conspicuous. Legs pale-gray: two anterior pairs of tarsi dull, with narrow, paler rings. Abdomen beneath concolorous with the under side of the wings.

Length of body, ♂, 0.60, ♀, 0.65: of fore wing, ♂, 0.65–0.70, ♀, 0.73: expanse of wings, 1.40–1.50 inches.

New Brunswick, opposite Calais, Me., August 19 (Shurtleff): Brunswick, Me. (Packard): Boston, Mass. (Sauhorn, Bost. Soc. Nat. Hist. C. A.

Shurtleff, C. S. (Minot): Natick, Mass. (Stratton); Salem, Mass. (Packard); West Farms, N. Y. (Angus); Albany, N. Y. (Lintner); Philadelphia, Pa. (Ent. Soc.); Pennsylvania and Maryland (Mus. Comp. Zool.); London, Canada (Mus. Comp. Zool.); Demopolis, Ala. (Grote); Texas, April 19 to May 5 (Belfrage); Lawrence, Kans. (Snow).

This common and widely-distributed species may be easily recognized by the very broadly-pectinated antennæ, the black pepper-and-salt wings, which are shorter than usual, and by the dark bands on the under side of the wings, together with the large discal dots, forming obscure round rings above. The lines are less waved than usual. The single, perfectly preserved individual from Alabama would at first be thought quite distinct from those commonly occurring in collections, which are worn and very variable in appearance. The species varies in the distance between the lines; sometimes the third line is doubled, as described by Guenée.

CYMATOPHORA CALIFORNIARIA Packard. Plate 11, fig. 25.

Cymatophora californiaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 387, 1871.

1 ♂ and 1 ♀.—This fine species belongs to Guenée's first group, and is allied to the European *C. repandaria*. The male is ash-colored, with numerous black scales, and is clouded more or less with dull ochreous patches. Antennæ well pectinated. The usual three transverse, black, diffuse lines present; the basal one is much curved, a little wavy, and ends on the costa at the basal third. On the costa, it is straight, just below pointed subacutely outward, and curved outward a little just below the median vein, thence going obliquely to the basal fourth of the inner edge of the wing. From the inner edge, a supplementary diffuse brown line accompanies it on the inner edge as far as the median vein. The middle line is sinuate, curved just below the costa, and toward the costa becomes much broader. The outer line is more clear, runs near the middle line, and consists of three wavy, slightly-marked scallops, one point resting on the lower submedian venule, the other on the third median venule. A submarginal, zigzag, white line; a scalloped, black, distinct line on the edge of the wing. Fringe ash-brown, three diffuse ochreous-brown patches on the inner edge of the wing. Hind wings marked like the fore wings: the basal line diffuse, blackish, straight; a rather obscure discal dot (none visible on fore wings). An outer slightly-scalloped line, like the basal one, not reaching the costa. It goes straight

from the inner edge to the middle of the discal area, where it makes a slight bend inward toward the costa; it is bordered without by a broad, diffuse, brown line. Beyond is a blackish submarginal line, a little angulated in the discal space; edge of the wing deeply scalloped, the points subacute. The female is ash, with a slight olive tinge on the fore wings, less ochreous, and the hind wing more deeply scalloped. The outer line is black, very distinct, angulated on the third median venule or just below it, and again on the lower subcostal venule. This line in the best-preserved specimen re-appears beneath, though interrupted, and the four discal spots are very prominent. A round black mark on the front of the head, and transverse black bands on the abdominal segments.

Beneath, pale-ash, with blackish scales and minute strigæ; discal dot on both pairs of wings large, rounded, and distinct; the outer line common to both wings faintly reproduced.

Length of body, 0.65; fore wing, 0.80-0.82; expanse of wings, 1.70 inches.

California (Behrens).

Desiderata.

Phalæna titea Cramer, iii, cclxxv, fig. C, 148, 1782; *Boarmia titearia* Guen., Phal., i, 248, 1857.—“Les antennes de cette Phalène arpeuteuse sont fortement plumacées; au dessous des ailes elles ont une couleur de gris de cendre, avec des bandes transversales et des points brunâtres. On l'a découverte dans la Virginie.”

Boarmia sublunaria Guen., Phal., i, 248, 1857.—“Je ne connais que la ♀, gris est extrêmement voisine de notre *Cinctaria*. Elle est d'un ton généralement plus clair. L'ombre qui précède l'extrabasilaire est d'un noir plus intense et très-détachée. Il n'y a point (au moins dans mon exemplaire) d'ombre médiane, et l'espace médian est d'un ton clair et uni. Il en est de même de la base des ailes inférieures jusqu'à la ligne qui répond à la coudée. L'abdomen est marqué d'une large bande noire sur le premier anneau. Amérique septentrionale. Une ♀. Coll. Guen. Elle pourrait bien n'être qu'une variété américaine de notre *Cinctaria*, ce qu'on ne saura bien que quand le ♂ sera connu.”

BRONCHELLA Guenée. Plate 5, fig. 4.

Epimeris Hübn., in part., Verz., 315, 1818.

Braconia Treits., in part., Schm. Eur., vi, 10, 187, 1897.

Dup., in part., Lep. France, vii, iv, 327, 1829.

Bronchela Guen., Phal., i, 286, 1857.

Walk., Last Lep. Het. Br. Mus., xxi, 150, 1860.

Front of the head moderately wide, not broader than long. Palpi rather large, broad at the end; third joint scarcely distinguishable from the second, reaching well in front of the head. Antennæ plumose, the ends being simple. Body as in *Cymatophora*. Wings very large and broad; fore wings with the costa straight, outer edge not quite so oblique as in *Cymatophora*, distinctly scalloped. Hind wings long, extending far beyond the end of the long slender abdomen, outer edge full, convex, and deeply scalloped. Venation: costal vein free. Six subcostal venules; first and second very long, equal in length; posterior discal venule very oblique, much more so than in the other genera of the subfamily. Hind legs in the male rather long; tibiae slightly swollen; tarsi one-third shorter than the tibiae. Coloration as in *Cymatophora*, though there is a slight brownish-ochreous tinge along the lines, which are deeply scalloped; both pairs of wings marked much alike.

The long hind wings, which extend far beyond the end of the abdomen, and are deeply scalloped, as well as the obtuse palpi extending beyond the front of the head, separate this genus from *Cymatophora* and *Tiphrosia*, with which it is most liable to be confounded.

Larva.—Short and very thick; head not so wide as the body; the third thoracic segment swollen beneath. (Described from a drawing by Abbot.)

BRONCHELLIA HORTARIA Guenée. Plate 11, fig. 26.

"*Phalana hortaria* Fabr., Ent. Syst., iii, 2, 138, 31, 1793."

Phalana breiodendrya Smith-Abb., Lep. Georgia, in, 203, pl. 102, 1797.

Epuraeis hortaria Hübn., Verz., 315, 1818.

Braconia hortaria Treits., Schm. Eur., vi, 10, 202, 187.

Dup., Lep. France, vii, iv, 1829.

Bronchela hortaria Guen., Phal., i, 288, pl. 2, fig. 5, 1857.

Bronchelia dendrya Guen., Phal., i, 289, 1857.

Tiphrosia amplaria Walk., Last Lep. Het. Br. Mus., xxi, 405, 1860.

Bronchelia breiodendrya Walk., Last Lep. Het. Br. Mus., xxi, 450, 1860.

Bronchela dendrya Walk., Last Lep. Het. Br. Mus., xxi, 451, 1860.

Bronchelia dissimilaria Walk., Last Lep. Het. Br. Mus., xxi, 451, 1860.

2 ♂ and 2 ♀.—Pale whitish-ash, dusted with brown; palpi and front of the head brown, vertex whitish; antennæ uniformly brown; prothoracic

scales edged with brown. Fore wings with five well-marked lines, the two basal approximate, parallel, and as well marked, as are all the others, on the costa, both slightly curved, oblique, and dislocated on the submedian vein; discal spot distinct, sublinear; the third line bends around outside it, but very near it, and nearly touches the fourth line just below the median vein; sometimes this is a broad, dark band (*B. dendraria* Guen.); fourth line a regularly and deeply scalloped band inclosing a white, similar line, blackish within, brown outside the white line, bent at right angles on the first median vein, thence curving around and ending beyond the middle of the inner edge; the fifth (and submarginal) is a dentate white line, parallel to the outer edge of the wing, the scallops filled in with blackish, the broad black band interrupted on the first median interspace; a marginal row of linear black lunules. Hind wings with no basal band; just before the short, lunate, discal dot, a diffuse brown shade (in var. *dendraria* broad and black and confused with the median scalloped line); middle line blackish, scalloped, edged externally with white, with a brown shade beyond; submarginal line as in the fore wings; marginal lunules long and linear. Fringe concolorous with the wings in both pairs. Beneath, with a faint testaceous tinge. Costa of the fore wings checkered with six black, square spots. The second and fourth lines reproduced quite distinctly; the fourth also present on the hind wings. A broad, dusky, submarginal shade on the fore wings, growing more distinct on the costa. Abdomen with two rows of black dorsal dots. Fore legs brown, with paler rings. Hind legs pale. In the female, the lines are not so well marked as in the male, but otherwise it does not differ.

Length of body, ♂, 0.80, ♀, 0.75; of fore wing, ♂, 1.10, ♀, 1.15; expanse of wings, 2.15 inches.

Philadelphia, Pa. (Ent. Soc.); Beaufort, N. C. (J. N. Trask); Knoxville, Tenn. (Dr. Josiah Curtis, Coll. Bost. Soc. Nat. Hist.); Coalburgh, W. Va., May 10 (W. H. Edwards).

This splendid moth may be known by its large size, the broadly pectinate plumose antennae, the fine, nearly straight lines on the fore wings, with the fourth bent once at right angles. It is the largest species of the group in the United States.

Guenée's *B. dendraria* is evidently represented by one of my specimens from North Carolina, in which the third and fourth lines are broad, confused,

and blended. It is evidently an abnormal effect, rather than indicating even a variety, in the usual sense of that word.

Larva.—Body very thick and rather short; head small, not so wide as the body. Pale yellowish; head pale reddish; body marked with pale bluish-green irregular slashes. Feeds on *Liriodendron tulipifera*.—(Described from Abbot's MS. drawing.)

GNOPHOS Treitschke. Plate 5, fig. 5

"*Scotopteryx*, *Cataseia*, *Ascalis*, *Dyscia*, and *Hyposcotis* Hübn., Verz., 1818.

Gnophos Treits, Schm. Eur., vi (3), 160, 1827.

Dup., Lep. France, viii (v), 202, 1830.

Boiscl., Gen. Ind., 199 7840.

H. Sch., Schm. Eur., iii, 71, 1847.

Charissa and *Gnophos* Steph., Cat. Br. Lep., 176, 1850.

Gnophos Lederer, Verh. Bot. Zool. Ges. Wien, 178, 1853.

Guen., Phal., i, 292, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 459, 1860.

Head rather narrow in front. Male antennae simple. Palpi rather slender, porrect, extending a little beyond the front. Fore wings broad; costa slightly convex; apex subacute, rectangular; outer edge bent in the middle. Hind wings extending beyond the abdomen, full on the outer edge, which is more or less scalloped. Venation: six subcostal venules; a long, narrow, subcostal cell; median venules much as in *Hemerophila*.

This genus differs from *Cynatophora* in the short, broad, more or less scalloped wings and simple antennae. From *Tephrosia*, it differs in the simple antennae and larger, broader, shorter wings. From *Hemerophila*, it may be distinguished by the simple antennae and less scalloped wings. In coloration, the species are dull ash-gray, with an indistinct, regularly-curved, extradiscal line and four discal dots. The markings resemble those of *Tephrosia* (*T. anticaria*) more than any other genus, but the species want the distinct dark lines. The single species known from this country occurs in Colorado, none having been found, as yet, east of the great plateau, or plains. It is nearly, but not very closely, allied to the European *G. pallata*, but is more reddish-ash-colored.

GNOPHOS BAYDENATA, sp. nov. Plate 11, fig. 27.

2 ♀.—Uniformly pale reddish-ash-gray; head whitish on the vertex, but the front and palpi are concolorous with the rest of the body and wings. Fore wings with no distinct markings, being dull ash-gray, with no markings

within the distinct, black, discal dot; the indistinct, regularly-scalloped, extradiscal line is bent outward opposite the discal dot, and thence goes, without much of a curve, to the inner edge; the corresponding line on the hind wings is regularly curved, though not much so, and the scallops are regular and well rounded; where the scallops touch the venules, there is a fine, white dot. Beyond this line, the margins of both pairs of wings are paler than within. Beneath, of the same hue as the under side of *Tephrosia canadaria*, being pale ash, the fore wings mottled with smoky spots, and the hind wings clear, and consequently lighter. The discal dots are distinct on both wings, but there are no other markings,

Length of body, ♀, 0.60; of fore wing, ♀, 0.80; expanse of wings, 1.60 inches.

Colorado Territory, August 3 (Mead); Clear Creek Cañon, Colo., August (Uhler, Hayden's Survey).

This species is respectfully dedicated to Prof. F. V. Hayden, in charge of the United States Geological Survey of the Territories.

HEMEROPHILA Stephens. Plate 5, fig. 6.

Hemerophila Steph., Cat. Br. Lep., 125, 1829.

Acidalia Treits. (in part), Schm. Eur., vi (ii), 5, 1828.

Boarmia Dup. (in part), Lep. France, vii (iv), 327, 1829.

Boisd. (in part), Gen. Ind., 196, 1840.

H.-Sch., Schm. Eur., iii, 76, 1847.

Hemerophila Lederer, Verh. Bot. Zool. Ges. Wien, 177, 1853.

Guen., Phal., i, 216, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 315, 1860.

Head square in front, not being very broad. Palpi large and stout, thick at the end, ascending somewhat, and extending well in front of the head. Male antennae heavily pectinated almost to the tip. Fore wings broad, rather long; costa straight or a little convex; outer edge either very oblique, bent in the middle, scalloped, with the apex acute, subfalcate, or the wing is short and broad, with no bend in the outer edge. Hind wings large, deeply scalloped; outer edge either moderately or very full. Venation: but five subcostal branches, the first very long; no subcostal cell. Hind tibiae long; tarsi two-thirds as long as the tibiae. Coloration dull reddish-ash, with very oblique lines, with a broad blackish shade beyond the extradiscal line on both wings.

The species of *Hemerophila* are readily distinguished by the peculiar markings, the dark, deeply-scalloped wings, the very broadly-pectinated antennae, and the large size of the species.

Synopsis of the Species.

Fore wings broad; hind wings full, deeply serrate on the entire outer edge *H. latifasciaria*
 Fore wings subfalcate, long; hind wings partly serrate *H. unitaria*.

HEMEROPHILA LATIFASCIARIA Packard. Plate 11, fig. 28

Hemerophila latifasciaria Pack., Proc. Bost. Soc. Nat. Hist., XVI, 33, 1874.

1 ♂.—Of medium size; antennae broadly pectinated; hind wings rounded, fuller than in *H. unitaria* and more deeply serrated, the entire edge being so. Body and wings pale ash; front with a round dark spot; palpi with the third joint black. Hind edge of prothorax and hinder edge of the basal segments of the abdomen with a black band. Fore wings reddish-ash, with a broad, curved, basal, blackish band; outer line slightly oblique; straight on the inner edge, curved inward in the middle of the wing, thence going straight to the costa; this portion of the line is represented by three or four venular dots, the costal one being the largest, while the posterior two-thirds of the line is bordered externally by two diffuse, parallel, broad lines, the whole making a broad band. Costal edge speckled with dark ash. Outer edge scalloped, with a black point between each scallop. Hind wings concolorous with the fore wings; two parallel slightly-waved lines; beyond the middle of the wing a very distinct, nearly straight, blackish line, with a supplementary brown shade beyond. A submarginal broad shade. A black line follows the scallops. Fringe pale ash. Beneath uniformly pale; costa with transverse dark strigae; the outer band forms a smoky shade beneath, and on the hind wings a smoky line. Legs ash-colored; two anterior pairs of tibiae and tarsi broadly banded with blackish.

Length of body, 0.60; fore wing, 0.73; expanse of wings, 1.50 inches.

California (Edwards); Sanzalito, Cal., September 28 (Behrens).

HEMEROPHILA UNITARIA Herrich-Schaeffer. Plate 11, fig. 29.

Hemerophila unitaria H.-Sch., Samml. Exot. Schm., 46, fig. 294, 1850-56.

Guen., Phal. i, 219, 1857.

Walk., List Lep. Het. Br. Mus., xxi, 317, 186, 1860.

4 ♂ and 1 ♀.—Body and wings whitish-ash; head brown in front, a whitish line just in front of the antennae; vertex whitish. Thorax whitish, with a transverse brown line on the front edge of the prothorax. Fore wings with two black linear lines, very oblique, not sinuous, and scalloped, the scallops very shallow; inner line curved outward below the costa, parallel with

the outer. The space between the two lines paler than the base of the wing. Outer line acutely angled in the last submedian interspace, curved outward before reaching the costa, on which there is a diffused dark spot. Beyond this line, the wing is brown, paler toward the apex; a faint, submarginal, whitish line. Fringe brown, with dark, slight lunules in the scallops; a small, black, discal dot. Hind wings with numerous, transverse, linear strigae; sometimes, especially toward the base of the wings, united and forming short lines. Two lines: the inner a diffuse band, inclosing and effacing the discal dot; outer line more distinct, slightly bent on the subcostal space. A broad brownish band beyond, reaching to the apex, and leaving the margin of the wing behind the two apical teeth pale. Hind wings deeply scalloped; the teeth large and acute. Fringe dark on the two apical scallops, pale posteriorly. Beneath, both wings paler than above, and uniformly transversely strigated; the outer line common to both wings more deeply scalloped than above; on the fore wings it is bent at right angles below the costa, ending in a dark costal spot. Costa with transverse unequal spots. Discal dots quite large and distinct. Abdomen brownish, with two rows of dorsal spots. The female is rather larger and decidedly paler than the male, with deeper scallops, and wanting the broad, marginal, brown band on both wings, while the fringe is pale. Beneath, the wings are not paler than above.

Length of body, ♂, 0.80; of fore wing, ♂, 0.90, ♀, 1.05; expanse of wings, 2.10 inches.

Montreal, Canada (Lyman); Andover, Mass. (Sanborn); Brookline, Mass., July 16, 22 (Shurtleff); Easton, Pa., and Illinois (Clemens).

This common form may be readily identified by the deeply-scalloped dentate wings, the brown margins, and the slightly-scalloped, straight, outer line of the fore wings, the straight outer line of the hind wings, and by its large size. In the Illinois specimen, the margin of the wings is much paler than usual, almost white, with a submarginal brown shade.

STENOTRACHELYS Guenée. Plate 5, fig. 7.

Stenotrachelys Guen., Phal., i, 290, 1-57.

Walk., List Lep. Het. Br. Mus., xxi, 457, 1860.

♀.—Head broader and more convex in front than usual. Palpi stout, thick, porrect, or very slightly ascending. Fore wings long and moderately broad; costa straight; apex subfalcate, subrectangular. Outer edge not very

oblique, scalloped. Hind wings more or less produced toward the apex; outer edge moderately full, either entirely serrate or toothed only toward the apex; the wings reach a little beyond the end of the abdomen. Venation: six subcostal venules; a long, narrow, subcostal cell. Coloration: whitish-ash, with a common, very distinct, black, extradiscal line.

The species of this genus, so far as regards the females, may be known by the well-scalloped wings and the large head, unusually full and convex in front. Unfortunately, no males have yet been obtained.

Synopsis of the Species.

Hind wings serrate on the entire outer margin; extradiscal line on hind wings bent outward.....*S. approximata*.
Hind wings partly serrate; extradiscal line nearly straight.....*S. permagnifica*.

STENOTRACHELYS APPROXIMARIA Guenée. Plate II, fig. 30.

Cynatophora approximaria Hübn., Exot. Schin., vi. B.-a., 1866.

Stenotrachelys approximaria Guen., Phal., i. 200, pl. 2, fig. 6, 1857.

Walk., Ill. List. Lep. Het. Br. Mus., xxi. 458, 1860.

1 ♀.—Vertex and front very full. Wings smaller than usual in proportion to the rest of the body: fore wings slightly dentate; hind wings acutely and quite regularly dentate. Body and wings whitish-gray. Fore wings with two distinct, heavy, black lines, the inner very near the base of the wing, regularly curved, a little pointed on the costa. Outer line bent at right angles on the basal third of the first median vein, the line thence going straight to the costa, though zigzag in its course; from the rectangular bend, the line follows a course subparallel to the median line, where it again turns rectangularly, ending on the middle of the inner edge of the wing. An inner reddish-brown line is parallel and near it below the median vein, and above passes just within the faint discal dot. Beyond this line, the wing is speckled with linear transverse strigæ; no brown shade. A scalloped, marginal, distinct, black line. Hind wings as the anterior pair, thickly dusted, the speckles becoming linear beyond the single median black line, which is distinctly bent outward and scalloped between the bend and the costa. The marginal scalloped line distinct. Fringe pale gray. Scallops regular, very equal in size; in this respect the species differs from *Homorophila unitaria*, in which they are very unequal, there being one deep-rounded one in the middle of the wing. Beneath, just as above, with the outer line faintly reproduced; no discal spots, and the marginal line faint. Legs and abdomen speckled like the wings.

Length of body, ♀, 0.60; of fore wing, ♀, 0.90; expanse of wings 1.90 inches.

North Carolina (Harris, Coll. Bost. Soc. Nat. Hist.).

This interesting species may be known by the outer line being bent at right angles much nearer the middle of the wing than in *Heimerophila unitaria*, in which the bend is remarkably acute very near the apex, while the wings are clear, not bordered with brown.

Larva.—"The caterpillar lives on *Smilax rotundifolia* and *laurifolia*, and, according to Abbot, on *Quercus*. It is also figured on a design of *Rhexia ciliosa*. It is of the same color as the moth, of an ash-gray washed with brown, with a dorsal series of white lozenges, lined with black and traversed in their middle by a twin, interrupted black vascular line. On each side of the lozenge is a black spot, and the first ring wants the lozenge and is traversed by a single continuous black vascular line. It is found in March and April, and the moth remains in the chrysalis until October."—Guénée.

STENOTRACHELYS PERMAGNARIA, *sp. nov.* Plate 11, fig. 31.

1 ♀.—This is one of the largest species of Phalenids. The head is smaller, less full above and in front; the apex of the fore wings more falcate and the hind wings less dentate than in *S. approximaria*, while it is a much larger form. Head, body, and wings whitish-ash; palpi blackish. Fore wings whitish-ash, speckled finely with dark scales, and mottled more coarsely on the costa. A dark costal spot midway between the insertion of the wing, and a second costal spot, which gives origin to the extradiscal line, which curves suddenly outward from this spot, and thence goes by a slightly sinuous course to the inner edge of the wing. The corresponding line on the hind wings is heavy, black, and slightly sinuous, not bent in the middle as in *S. approximaria*. Beneath of the same hue, but the wings are mottled with smoky spots, and there is a large discal spot on each wing not seen above.

Length of body, ♀, 0.90; of fore wing, ♀, 1.12; expanse of wings, 2.30 inches.

Missouri (Riley).

CLEORA Curtis. Plate 6, fig. 3.

Synopsis Hübn. (in part), Verz., 317, 1818.

Not *Cleora* Curtis, Brit. Ent., pl. 88, 1825.

Boarmia Treits. (in part), Schm. Eur., vi (i), 1827.

- Chora* Steph. (in part), Nomencl. Br. Ins., 43, 1829.
Bourmia Dup. (in part), Lep. France, Vireux, 327, 182.
 Boid. (in part), Gen. Ind., 196, 1840.
 Dup., Cat., 231, 1841.
 H.-Sch., Schm. Eur., iii, 76, 1847.
Chora Steph., Cat. Br. Lep., 471, 1850.
Bourmia Lederer (in part), Verh. Bot. Zool. Ges. Wien, 177, 1853.
Chora Guen., Phal., 3, 230, 1857.
 Walk., List Lep. Het. Br. Mus., xxi, 330, 1860.

Head full in front, as long as broad: male antennæ plumose; palpi very slender, acute, extending a little beyond the front of the head. Fore wings with the costa more convex than usual, the apex either somewhat rectangular or somewhat produced; outer edge slightly bent, less oblique than in *Cymatophora*. The hind wings do not reach beyond the tip of the abdomen: they are rounded, entire, sometimes a little produced toward the apex. In the venation, this genus is intermediate between the genuine *Bourminæ* and the *Ennominæ*. The costal vein anastomoses with the subcostal. There are six subcostal venules: a rhomboidal, short, subcostal cell, sometimes a second one beyond (in the specimen figured on plate 6, fig. 3, it is represented as open). The wings are thin, semihyaline, and whitish, with two irregularly-scalloped dark lines on the fore wings, and one extradiscal scalloped line on the hind wings. The discal dots are very distinct. Hind male legs long and very slender, the tibiæ not being swollen; the tarsi are one-fourth shorter than the tibiæ. Abdomen long and slender. Curtis's genus *Chora* is really synonymous with *Cymatophora* (*Bourmia*). The type being *Cymatophora* (*Bourmia*) *cinctaria*, there is no good reason why it should be retained, though I do so, following customary usage.

Larva.—"Caterpillars of medium length, rough, color of lichens, flattened beneath, with all the rings ornamented with conical tubercles; head small, globular; living on the lichens of trees."—Guenée.

Pupa rather long, with broad, longitudinal, brown bands. Guenée states that it is placed under bark or under moss in a light net-work of threads.

The species are easily recognized by the unusually transparent wings, their whitish color, and the dark scalloped line and distinct discal dot, and resemble the species of *Zerene*.

Synopsis of the Species.

Wings comparatively clear; extradiscal line bent slightly backward on the costa *C. polidaria*.
 Wings densely speckled; extradiscal line directed toward the apex *C. andrea arca*.
 Extradiscal line less oblique than usual; veins black *C. nigromaculata*.

CLEORA PULCHRARIA Minot. Plate 11, fig. 32; pupa, plate 13, fig. 13.

Cleora pulchraria Minot, Proc. Bost. Soc. Nat. Hist., xiii, 170, 1869.

Zerene pinioria Pack., New and Little Known Insects, 11, 1870.

Cleora pellucidaria Pack., Fifth Rep. Peab. Acad. Sci., 78, 1873.

7 ♂ and 8 ♀.—Pale ash, with dense brown scales, or white, with fine dusky scales. Head deep yellow, paler in some; in one female, white. Body, including abdomen, white; legs dusky externally. Fore wing crossed by two black lines, clearly cut in the white examples, diffuse on one side in dark specimens; their distance apart varies greatly; in two closely-allied female individuals, the lines vary in being separated by a distance equal to half the length of the wing, while in the others they touch just below the median vein. The inner line consists of four scallops, the fourth and lowest half-formed; the first or costal is often indistinctly marked; discal dots distinct, larger on the fore wings than on the posterior pair. Outer line sinuate, scalloped, with a great curve outward between the subcostal and the third median venule. Opposite the discal dot are three acute, smaller scallops, all of equal size. Fringe whitish, distinctly checkered with black on the ends of the venules. Hind wings with a scalloped outer line, often obsolete toward the costal edge, varying in its distance from the outer edge. Beyond this line, the wing is darker than at the base. Beneath as above, but sometimes a little clearer.

Length of body, ♂, 0.50, ♀, 0.40–0.50; of fore wing, ♂, 0.60, ♀, 0.55–0.65; expanse of wings, 1.30 inches.

Brunswick, Me., September (Packard); Salem, Mass. (Cassino); Massachusetts (Sanborn); Boston, Mass., September (Minot); Albany (Lintner and Meske); Philadelphia, Pa. (Ent. Soc.).

This delicate pretty moth may be known by the three equal, acute, small teeth opposite the discal spot. It varies much in color, some being smoky-ash and densely scaled, others being almost snow-white and with very fine specks.

The form which I described as *pellucidaria* is a rather larger and more dusky, smoky pellucid form than usual. Head white, front a little dusky; palpi dark. Thorax and body pale mouse-colored. Wings of the same hue. Inner line not so much curved, and outer line much as usual, but with the three teeth a little longer and less even. The lines are duller, and do not contrast so much with the rest of the wing as in the ordinary form. Fringe

mouse-colored, with faint dark checks. Beneath as above, but more uniformly mouse-colored, with the outer line as on the fore wings very faint, and no markings on the hind wings, or with the outer line indistinct, but common to both wings. Length of body, ♀, 0.55–0.65; of fore wing, ♀, 0.67–0.80 inch.

The ♀ individual figured on plate 11 (fig. 35), received from Alaska through Mr. Behrens, is a remarkable form; but I will provisionally regard it as a variety of the present species, having already described one too many in this genus. It is dark, smoky, with the lines and discal dots very broad and heavy. The inner line is slightly scalloped; the outer is bent inward, more on the costa than in *pulchra*. The band on the hind wings is nearly obsolete, and the discal dot is very large. Length of body, 0.60; of fore wing, 0.95; expanse of wings, 2.00 inches.

Larva and pupa.—Mr. W. Saunders has raised the moth from the larva found by him on the pine. He states that “the larva is a geometer, and is striped with red”. The pupa (plate 13, fig. 13) is rather thick, white, with a broad light-brown band along the back, becoming widest in the middle of the body. There is also a narrow brown band along the side of the body, and on the under side of the abdomen are four longitudinal stripes of the same color. The wings are slashed with light brown, and the antennae and fore legs are concolorous, while the middle and hind legs are white. Length, 0.44 inch.

CLEORA UMBROSARIA Packard. Plate 11, fig. 33.

Cleora umbrosaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 23, 1874.

4 ♂.—Body and wings ash-colored, or pepper-and-salt; vertex of head pale ash. Fore wings crossed by two scalloped lines, the scallops rounded, not pointed; the basal line straight from the costa to the median vein, thence curved inward to the inner edge of the wing; outer line begins on the outer quarter of the costa, and follows a nearly straight course to the outer third of the inner edge, there being no great curve above the third median venule, as in *C. pulchra* Minot of the Eastern States. Discal dot black. Hind wings sometimes without any line; the wing is speckled with dark gray on the outer third. Beneath, the wings are uniformly ash-colored, the fore wings scarcely darker than the hinder pair. No discal spots or other markings.

Length of body, 0.55; of fore wing, 0.75; expanse of wings, 1.60 inches.

California (Edwards); Victoria, Vancouver Is. (Crotch).

This seems to be a larger species than the two eastern ones, and differs in the outer line being nearly straight in its course, the scallops being well rounded, and in having no line on the hind wings, and no markings apparent on the under side of either pair. The fore wings are sometimes much produced at the apex as in the race or variety *pellucidaria*. The antennae are broadly pectinated, as usual.

Specimens received from Victoria, Vancouver's Island, through Mr. Crotch (Mus. Comp. Zoöl.), are very light, and have the inner line on the fore wings scalloped much as in *pulehraria*, while the outer line arises very near the apex, being very oblique. On the hind wings, there is an extradiscal line, bent outward in the middle, much as in the fore wings. It is one of these specimens which is figured on the plate (fig. 33).

CLEORA NIGROVENARIA, *sp. nov.* Plate 11, fig. 34.

2 ♂ and 2 ♀.—Wings rather thicker and darker than in the other two species. Head and body dark ash-gray. Fore wings uniformly dusky-ash, the inner line scalloped, sending out a point on each vein, curved outward much as usual. Discal dot distinct. The extradiscal line is much less oblique than in the other species, there being a rectangular bend in the discal space, and from thence running straight to the inner edge of the wing, though the line is scalloped. A submarginal, faint, wavy line. The principal distinguishing mark of the species are the black veins, the black portions not present within the basal line, and beyond this being interrupted by the transverse lines. Hind wings immaculate, being uniformly clear smoky-ashen, and concolorous with the under side of both wings.

Length of body, ♂, 0.58, ♀, 0.60; of fore wing, ♂, 0.75, ♀, 0.78; expanse of wings, 1.50 inches.

Victoria, Vancouver's Island, July (Crotch, Mus. Comp. Zoöl.).

Desiderata.

Anisopteryx restituens Walk., Can. Nat., v, 263, 1860; List Lep. Het. Br. Mus., xxvi, 1696, 1862.—This is probably *A. vernata*.

Anisopteryx sericeiferata Walk., List, 1697, 1862.—This is undoubtedly *A. vernata*.

Synopsisia phigaliaana Guen., Phal., i, 225, pl. 4, fig. 1, 1857.—"42^{mm}."

Ailes d'un gris-olivâtre, lavées de roux et d'ochracé, avec une ligne médiane commune, noire, sinuee, anguleuse et précédée d'une ombre noirâtre avec le bord terminal plus obscur et précédé de brun fondu. Supérieures prolongées à l'apex, marquées de trois grandes taches blanches costales, arrondies, très-nettes, souvent suivies ou précédées d'un point blanc; la troisième apicale. Dessous d'un blanc jaunâtre, fortement picoté de noir; les supérieures avec des lignes noires, très-confuses, et une liture terminale entre 1 et 2; les inférieures avec deux lignes médianes contiguës, et les atomes condensés en bordure.

"Amérique septentrionale. Un ♀ en mauvais état. Coll. Bdv.

"Elle ressemble un peu à une *Amphidasya* par son dessin picoté, ou à une *Phigalia* par sa forme."

Bourmia clivaria Guen., Phal., i, 245, 1857.—"Port de *Pampinaria*, mais un peu plus grande (35^{mm}); d'un blanc-grisâtre, sans aucune nuance jaune, finement saupoudré de noir, avec un feston terminal bien marqué en noir et la frange nettement entrecoupée de la même couleur. Les dessins sont à peu près les mêmes que chez *Pampinaria*, c'est-à-dire une extrabasilaire doublée par une seconde ligne écartées par en haut, réunie par en bas; une condée dans le même cas et, de plus, suivie d'un filet d'un brun clair, et une subterminale commune peu marquée, ombrée de noir çà et là, surtout à la côte des premières ailes et à l'angle anal des secondes. Celles-ci ont une fine ligne médiane, semblable à la condée, surmontées d'un trait cellulaire, puis d'une seconde ligne qui n'atteint point la côte. Dessous clair, avec un trait cellulaire et une ombre subterminale.

"Californie. Un ♂. Coll. Bdv."

Bourmia porcellaria Abbot, Guen., Phal., i, 252, 1857.—"33^{mm}. Ailes d'un cendré un peu jaunâtre, fortement sablé de noirâtre, avec les lignes disposées comme dans la *Guopharia*, mais un peu mêlées de jaune d'ocre. La tache cellulaire se réduit ici à un simple trait arqué, qui, aux ailes supérieures seulement, forme parfois, avec un arc de l'ombre médiane, une sorte de tache ovale, évidée. Dessous d'un gris-ochracé clair, peu sablé, avec un trait cellulaire et la ligne médiane dessinés en noirâtre et assez vagues, hormis sur les nervures. Une bande noire sur le front. À la base des ailes supérieures se voit une sorte de vésicule qui, en dessous, forme une petite fossette arrondie.

"Amérique septentrionale. Trois σ . Coll. Mus. et Bdv.

"Cette espèce rappelle aussi les *Guaphos*, mais plutôt la *Mucidaria* que l'*Obscurata*; elle paraît varier, car les trois individus que j'ai sous les yeux sont tout assez différents. Peut-être même y a-t-il plusieurs espèces.

"La chenille n'a aucune éminence proprement dite, seulement, le 6^e anneau a le dos renflé et un petit tubercle latéral en pyramide; enfin, le 11^e anneau porte deux petites pointes. Elle est d'un gris-testacé clair, avec une ligne latérale ondulée, noire, au-dessus de laquelle le fond devient plus foncé et est marqué d'un trait noir dans les incisions. Sur les trois premiers anneaux la ligne est remplacée par un trait isolé. La tête et les pattes sont concolores. Elle vit sur la *Porcella pygmaea*."

Amphidasys sperataria Walk., List Lep. Het. Br. Mus., xxi, 307, 1860.—

"*Male*. Cinerous, with a slight ochraceous or olive tinge. Antennæ broadly pectinated to the tips. Thorax with a brown band in front. Wings thickly black-speckled, with two irregular oblique zigzag nearly parallel black lines, the first having along its inner side a diffuse blackish band; marginal lunules black. Fore wings broader than those of *A. cognataria* and with the exterior border less oblique.

"Length of the body 7 lines; of the wings 18 lines.

"*a*. United States. Presented by E. Doubleday, Esq."

Bourmia filaria Walk., List Lep. Het. Br. Mus., xxi, 347, 1860.—"

"*Male*. Brownish cinereous, black-speckled. Antennæ broadly pectinated, except at the tips. Abdomen attenuated, extending somewhat beyond the hind wings. Hind tibia incrassated. Wings rather short; exterior line blackish brown, undulating, parallel to two more exterior diffuse brown bands, of which the second is limited on the outer side by the zigzag whitish submarginal line; middle line less distinct; marginal lunules blackish; discal mark lunulate in the fore wings, guttular in the hind wings; under side with the three lines apparent. Fore wings with a curved blackish brown interior line; a testaceous tinge along the costa, where there are many minute transverse black lines.

"Length of the body 8 lines; of the wings 16 lines.

"*a*. East Florida. Presented by E. Doubleday, Esq."

(This is a valid species and near *C. umbrosaria*.—A. S. P.)

Cleora tinctaria Walk., List Lep. Het. Br. Mus., xxi, 486, 1860.—"

"*Female*. Whitish. Body, legs, and wings thickly speckled with brown. Palpi very

short, extending a little beyond the head. Hind borders of the abdominal segments white. Fore wings with five brown undulating diffuse and incomplete lines, which are composed of confluent speckles, and are almost obsolete on the under side: third and fourth lines nearly contiguous: marginal line composed of elongated black points: discal mark black, transverse. Hind wings with less distinct marks.

"Length of the body 4 lines: of the wings 12 lines.

"Canada. In Mr. D'Urban's collection."

Cleora limitaria Walk., List Lep. Het. Br. Mus., xxi, 487, 1860; Can. Nat., vi, 39, 1861.—"*Female*. Whitish. Palpi mostly black, very short, extending a little beyond the head. Fore wings with five dentate undulating black lines, and with three brownish cinereous bands: second and third lines less distinct than the fourth, which forms two conspicuous angles, and is most strongly marked hindward: second and third bands with cuneiform angles on the exterior side: third much abbreviated hindward: marginal line composed of pairs of black points: discal mark small, black, transverse. Hind wings, with a discal dot and with two indistinct exterior lines.

"Length of the body 4 lines: of the wings 12 lines.

"Canada. In Mr. D'Urban's collection."

Cleora dirisaria Walk., List Lep. Het. Br. Mus., xxi, 487, 1860.—"*Male*. Cinereous. Palpi porrect, extending rather far beyond the head, blackish on the outer side: third joint conical, very minute. Fore wings with a brown mark by the base of the costa, and with five brown lines: first line slightly undulating: second and third approximate, parallel, undulating: fourth and fifth approximate and very undulating, parallel, except towards the costa, where they diverge: marginal points brown. Hind wings with two indistinct exterior lines.

"Length of the body $4\frac{1}{2}$ lines: of the wings 12 lines.

"Canada. In Mr. D'Urban's collection."

Boarmia? ejectaria Walk., List Lep. Het. Br. Mus., xxi, 489, 1860.—"*Male*. Pale brownish, more cinereous beneath. Antennae slightly pectinated. Tibiæ with blackish bands: hind tibiæ incrassated. Wings slightly and irregularly blackish-speckled, with a blackish slightly undulating middle line, which is irregularly double toward the interior border: a more indistinct

interior line; discal point and marginal points black; under side without lines. Fore wings with a submarginal line, which is composed of black dots in front, and is obsolete hindwards. Hind wings with a submarginal line of black points.

“Length of the body 6 lines; of the wings 16 lines.

“Canada. In Mr. D’Urban’s collection.”

Boarmia divisaria Walk., List Lep. Het. Br. Mus., xxi, 489, 1860.—
“*Female*. Whitish cinereous, thinly brown-speckled. Abdomen blackish at the base and on the sutures of the segments. Wings ample, with a regular oblique brown band, which is bordered with black on the inner side, and is intersected by black streaks; marginal dots black; under side without lines. Fore wings with a basal band, which is much like the middle band.

“Length of the body 6 lines; of the wings 20 lines.

“Canada. In Mr. D’Urban’s collection.”

(This is apparently a valid species.)

Subfamily ENNOMINÆ Guenée (emend.).

“*Ennomidi* Guen. MS.” before 1844; Dup., Cat., 216, 1844.

Subtribe *Ennomites* Dup., Cat., 216, 1844.

Subfamilies *Odyneridi* and *Epionidi* (in part) Steph., Cat. Br. Lep., 164, 180, 1850.

Families *Urapterygida* and *Ennomida* Guen., Phal., i, 26, 64, 1857.

Walk., List Lep. Het. Br. Mus., xx, 4, 65, 1860.

Body stout, the thorax often hairy, and the abdomen long and slender, well tufted at the end. Head rather narrow in front, especially in the higher genera (*Drepanodes* and *Eutrapela*), with the scales appressed to the clypeus, or loose and projecting, forming an interpalpal tuft. Palpi rather stout and large, porrect or ascending, passing beyond the front; third joint small, distinct, button-shaped or pointed. Male antennæ, as a rule, more heavily pectinated than usual, rarely simple, sometimes with short pectinations in the female. Wings large and usually angular, the anterior pair with the apex falcate, rarely rectangular; the outer edge often deeply excavated and scalloped on each side of the prominent angle on the first median venule. Hind wings usually with a prominent angle, rarely rounded. Venation: one subcostal cell is nearly always present; it is either short and rhomboidal or long and narrow. The costal vein almost invariably anastomoses with the subcostal. Hind legs with the tibiae often large, long, and much swollen, sometimes with a pencil of long thin hairs; tarsi short, one-half to two-thirds as long as the tibiae. The

species are nearly always yellow, or ochreous-brown, with distinct intra- and extradiscal lines on the fore wings. They are very rarely white, as in *Metrocampa* and certain species of *Tetraxis* and *Eugonia*.

Larva and pupa.—The caterpillars are large and long, often mimicking the twigs of the trees or shrubs on which they feed, sometimes ornamented with tubercles; the head is sometimes very large, often with large tubercles on each side, with from two to four pairs of abdominal feet. Chrysalides large, conical at the tip, of various hues, often protected by a thin cocoon.

The fact that genera so closely allied as *Drepanodes* and *Eutrapela* are placed separately in the families “*Ennomidae*” and “*Crapterygidae*” by M. Gueneé seems to me a proof that the groups are artificial ones and should be united.

Synopsis of the Genera.

A. Wings angular; costa full:

- Wings with a very prominent median angle in both pairs; that on the hind wings much rounded; female antennae pectinated..... *Hyperotis*,
Like *Hyperotis*, but the female antennae simple, and the fore wings more deeply excavated..... *Plagalis*,
Species small, yellow; male antennae simple; wings angular..... *Neotlocampa*.

B. Wings entire; not angulated:

- A slight sinus in hind wings; four costal brown spots..... *Caulostoma*,
Hind wings with a deep sinus; species deep yellow..... *Angerona*,
Like *Angerona*, but with no sinus in the hind wings; deep yellow..... *Opisthocryptis*.

C. Wings very angular; falcate:

- Hind wings rounded; female antennae pectinated; yellow..... *Heterolocha*,
Male antennae pectinated; fore wings suddenly excavated below the falcate apex;
hind wings with a slight angle; yellow..... *Sieya*,
Like *Sieya*, but male antennae simple; hind wings with a very prominent angle;
yellow..... *Antipione*,
Fore wings less falcate than in *Antipione*; hind wings excavated below the acute apex..... *Epione*.

D. Wings slightly angular; broad:

- Male antennae well pectinated; wings moderately angular; brown, with a very broad median band in the middle of the wing..... *Amegilla*,
Fore wings falcate; hind wings well angulated; male antennae subplumose; pearly-white..... *Metrocampa*,
Like *Metrocampa*, but male antennae more plumose; ochreous or whitish-ochreous..... *Phaena*,
Fore wings bent, falcate; hind wings rounded; male antennae heavily pectinated..... *Apoca*,
Like the lower species of *Endropia*; wings entire; species deep reddish-brown;
hind wings in part ochreous; beneath ochreous..... *Epuraethia*.

E. Fore wings usually falcate; front of the head rather narrow:

- Fore wings usually falcate, and both wings entire, notched or serrate..... *Endropia*,
Male antennae simple; wings well scalloped, noctuid like..... *Ischna*,
Fore wings falcate; both wings serrate; hind tibiae not swollen; brownish-ochreous, with violet tints..... *Scheria*.

Head with the hairs projecting, forming a frontal tuft; palpi unusually long and acute; female antennae pectinated; wings falcate, deeply scalloped; species yellow or white.....	<i>Eugonia</i> .
Fore wings broad, not falcate; apex rectangular; outer edge with a slight angle, sometimes obsolete.....	<i>Cabrerodes</i> .
Fore wings regularly falcate; hind wings well rounded.....	<i>Drepanodes</i> .
Head short, small; palpi small, scarcely extending beyond the front; wings very angular and falcate.....	<i>Metaema</i> .
Palpi rather long; male antennae usually pectinated; hind wings shorter, with a more marked angle than in <i>Eutrapela</i>	<i>Tetracis</i> .
Male antennae simple; fore wings falcate; hind wings with a prominent angle; the outer margin of both wings sometimes slightly scalloped.....	<i>Eutrapela</i> .

HYPERETIS Guenée. Plate 5, fig. 8.

Hyperetis Guen., Phal., i, 117, 1857.

Probole H.-Sch., Ausserer, Schin., 63, 1850-58.

Metrocampa H.-Sch. (in part), Ausserer, Schin., 63, 1850-58.

Hyperetis Walk., List Lep. Het. Br. Mus., xx, 144, 1860.

Front broad; vertex and front continuously and thickly scaled. Palpi much ascending, broad, and rather stout; tip of second joint truncate, surpassing the front; third joint minute, obtuse, depressed. Antennae rather narrowly pectinated to the tip. In the female, the pectinations are half as long as in the male. Thorax slender. Fore wings unusually long and narrow; costa convex, especially at the base; apex acute. The angle between the second and the third median venules much rounded and prominent, much excavated below the apex, and below the angle in the middle of the wing; more angulated in the female than in the male. Venation as in *Plagodis*, but the costal region is wider; the costal and first two subcostal venules are shorter; the second median is shorter; the third subcostal divides much nearer the origin. Hind wings with the internal angle not rounded, not reaching to the tip of the abdomen; apex rounded; middle angle of the outer edge large and rounded, the outline being very sinuous. Legs long; hind tibiae slender; spurs long, and the two pairs of equal length; hind tarsi three-fourths as long as the tibiae. Abdomen moderately slender; tip acute. Coloration: pale, dusted with ochreous. An outer line, very much angulated toward the middle angle of outer margin, with internal and subapical dark patches.

The long, narrow fore wings, acute apex, and rounded, large, middle angle, and acutely-angulated extradiscal line distinguish this genus from *Plagodis*, to which it is nearest allied; but it differs in the more acute apex of the fore wing, the more sinuous outer edge, the angle being much rounded

and very conspicuous, while it is usually nearly obsolete in *Phagodis*. In coloration, also, the two genera differ decidedly, the extradiscal line being produced into a long angle, while in *Phagodis* there is no angle, but the line is straight in its course. The female antennae are also narrowly pectinated, where they are simple in *Phagodis*.

Larva.—"Caterpillars with 40 feet, elongated, cylindrical, pedunculi-form, without eminences; head lenticular; living on trees. Chrysalides ochraceous, contained in a net between leaves."—Guenée.

HYPERETIS NYSSARIA Guenée. Plate 11, figs. 37, 38, 39, 40; plate 13, fig. 42.
Larva and pupa, plate 13, figs. 19, 19*a*, 25, 25*a*.

Geometra nyssaria Abbot, MS. (Guenée).

Metrocampa ambigua H.-Schl., Ausserem. Schin., 63, fig. 361, 1850-58.

Proble alouaria H.-Schl., Ausserem. Schin., 63, fig. 364, 1850-58.

Hyperetis nyssaria Guen., Phal., i, 118, 1857.

Hyperetis casimaria Guen., Phal., i, 118, 1857.

Hyperetis amicarua Guen., Phal., i, 118, 1857.

Hyperetis insinuaria Guen., Phal., i, 119, 1857.

Hyperetis persinuaria Guen., Phal., i, 119, 1857.

Hyperetis subsinuaria Guen., Phal., i, 119, 1857.

Hyperetis alouaria Guen., Phal., i, 120, 1857.

Hyperetis nyssaria Walk., Ill. List Lep. Het. Br. Mus., xx, 145, 1860.

Hyperetis casimaria Walk., List Lep. Het. Br. Mus., xx, 145, 1860.

Hyperetis ambigua Walk., List Lep. Het. Br. Mus., xx, 145, 1860.

Hyperetis insinuaria Walk., List Lep. Het. Br. Mus., xx, 145, 1860.

Hyperetis persinuaria Walk., List Lep. Het. Br. Mus., xx, 146, 1860.

Hyperetis subsinuaria Walk., Ill. List Lep. Het. Br. Mus., xx, 146, 1860.

Hyperetis alouaria Walk., Ill. List Lep. Het. Br. Mus., xx, 146, 1860.

Hyperetis nyssaria Walk., Ill. List Lep. Het. Br. Mus., xx, 146, 1860.

Asolina nyssaria Walk., Ill. List Lep. Het. Br. Mus., xx, 186, 1860.

12 ♂ and 3 ♀.—Pale whitish-ash, with rather thick blackish speckles. An inner curved line pale brown, dilated on the costa, frequently fading out before reaching the hind edge of the wing; the outer line forms a great angle in the first median cell, the point near, but at varying distances from, the outer edge. Beyond the line, the wing is brown, either reddish or amber brown, with dark strigæ, and a pair of diffuse black spots just below the third median venule, one just about the point of the outer line, and one just below the costa near the apex, the latter having an oblique, pale, broad streak. Hind wings like the anterior pair; but the outer line is sinuate, not deeply angulated, and the edge of the wing is either clear, like the rest of the wing, or filled with reddish-brown, as on the fore wings. Beneath, as above, but much more thickly speckled, with the four discal dots plainer than above. Veins brown, lines as above (inner line on fore wing wanting).

Apical portion of the fore wings reddish, and hind wings often shaded with reddish beyond the outer line. The fringe varies with the color of the wing, being speckled with brown or reddish, with a hair-line at the base.

Length of body, ♂, 0.50–0.55, ♀, 0.45–0.50; of fore wing, ♂, 0.60–0.65, ♀, 0.55–0.75; expanse of wings, 1.00–1.50 inches.

Maine, June 16 (Packard); Mount Washington, N. H., July (Morrison); Essex County, Vt., July (Cassino); Amherst, Mass. (Peabody); Natick, Mass., June 27 (Stratton); Massachusetts (Sanborn, Bost. Soc. Nat. Hist.); Albany, N. Y. (Meske and Lintner); New Jersey (Sachs); Philadelphia, Pa. (Grote); Maryland (Mus. Peab. Acad. Sc.); West Virginia, April 26 (Mead); Saint Louis, Mo., October 5 (Riley); near Mammoth Cave, Ky., April 27 (Sanborn, Ky. Geol. Surv.).

This protean form varies greatly in the color of the wings, owing to the degree of speckling and distance of the point of the outer line from the edge of the wing, the point being occasionally short and obtuse, and then obsolete, as in var. *amicaria* H.-Sch.

The distinctness of the submarginal black spots varies, being sometimes entirely absent, and the outer edge of the hind wings is sometimes pale and sometimes reddish-brown.

In another individual (♂), from Natick, Mass., the angle of the outer line is very obtuse and short, the point being nearly as far from the edge of the wing as on the costa, the space beyond being reddish-brown, and with scarcely any specks; the wings are less falcate and angulated than usual. Beneath, the outer edge of the wings has a faint violaceous hue.

Fig. 40 represents the normal, most abundant form of *II. nyssaria*. Fig. 39 represents var. *amicaria* H.-Sch. In this form, the outer third of both pairs of wings is clear brick-red or red, with a decided purplish tinge; the wings within are whitish, as in the normal *nyssaria*; the inner line on the fore wings is broad. I have received it from Lawrence, Kans. (Snow) and Alabama (Grote). Fig. 37 represents a second small variety, in which the outer third of both wings is pale reddish; the lines are distinct, reddish-brown, and the inner two-thirds of the wings is tinged with reddish.

This form merges into another (closely resembling Walker's *II. nepiasaria* from Nova Scotia), which nearly agrees with Guenée's description of *II. insinuaria*, in which the entire surface of the wings is nearly uniformly pale reddish-brown, with three submarginal dark spots, one subapical, one in

the middle, and one near the inner angle of the wing; in one specimen, the inner two-thirds of the wing is paler, somewhat whitish, thus approaching the normal color of *nyssaria*. The three specimens are from Detroit, Mich. (Swartz, Mus. Comp. Zööl.), Brewster's, N. Y. (Grote), and from Dallas, Tex. (Boll).

Walker's *nepiasaria* (plate 13, fig. 12) is a small individual, with the middle of the fore wings yellowish and the remainder pinkish; hind wings yellow, outer third pinkish.

A fourth variety is represented by fig. 38, of which the following is a description: 2 ♀.—Cinereous, with an obscure lilac tinge. Palpi stout, long, porrect, tipped with black. Head, body, and wings at base concolorous. On the fore wings, a broad, zigzag, brown line, pointed acutely four times on the nervules, the last time on the costa, shaded within on the costa; internal margin strigated with black more than the rest of the wing; middle of the wing clearer than the base; outer line very large, elongated; angle obtuse, going much nearer the outer edge than usual; apex rounded, not acute as usual; line fuscous; beyond fawn-color, with a lilac tinge; a costal dark streak near the apex, which is falcate, produced a little more than usual, well excavated beneath; angle distinct in the middle, rounded, below well excavated; discal dot indistinct on both wings. Hind wings same as the fore wings, deeply excavated on each side of the mesial, prominent, rounded angle. Beneath, the body is fusco-cinereous; wings ochreous, with fuscous strigæ, margin of the wing violaceous, except on the fore wing toward the costa, where it becomes ochreous, and directly on the costa whitish-cinereous.

Length of the body, 0.40; of fore wing, 0.55 inch.

Natick, August 2 (Stratton); Illinois (Clemens).

This variety is easily known by the cinereous body, with the outer margin fawn-colored, which becomes violaceous on the under side, and without the usual dark, violaceous spots on the margin near the inner angle; beneath, more distinctly ochreous than usual; the apex is falcate, as usual, and the mesial prominence well marked; the angle of the outer line is also more produced, and ends in an obtuse, rounded point.

This species is so exceedingly variable that no one can be blamed for regarding the more aberrant forms as good species, if they have but a single specimen; but, with the excellent material I have had, I have little hesitation in regarding the synonymy given above as approximately correct, and

that all the North American "species" of the genus thus far described are variations of Abbot's *nyssaria*.

Larva.—Body rather thick; head narrower than the body, which is green, with a dorsal interrupted stripe descending on the sides of the thoracic and terminal abdominal rings. In another larva (fig. 25), of a variety with the wings bordered with red (*amicaria*), the larva is the same as in the one represented in fig. 19.—(Described from Abbot's MS. drawings.)

A MS. colored drawing by Abbot (copied on plate 13, figs. 19, 19 *a*, pupa) represents the caterpillar as rather thick, but uniformly so, green, with a violet dorsal stripe, and a similar lateral stripe on the sides at the end of the body. Its food-plant is *Hypericum rosmarinifolium*. The pupa is colored brown.

The larva feeds on the beech, according to Mr. Saunders, who informs me that it forms a rude case by binding two leaves together with silk. It is an inch long and dark brown, with a row of dull-white dots on each side. On the posterior part of the ninth segment are two rather prominent, rounded, black tubercles, with a few streaks of whitish at their base anteriorly. The terminal segment is flattened and of a bluish tint.

Desideratum.

Selenia asionaria Walk., List Lep. Het. Br. Mus., xx, 182, 1860,—"*Male*. Whitish ochraceous, darker beneath. Palpi extending a little beyond the head; third joint conical, very minute. Wings thickly blackish-speckled; exterior line brown, slightly undulating, diffuse on the outer side. Space between it and the exterior border purplish-tinged; exterior border forming a much rounded angle. Fore wings rectangular at their tips; interior line brown, slightly undulating and angular, diffuse on the inner side; discal lunule blackish; exterior line forming an extremely deep bend opposite the angle. Hind wings with a brown discal point; exterior border excavated on each side of the angle. Length of the body 6 lines; of the wings 18 lines. New York."

This is certainly a species of *Hyperetis*, as I learned by examination of Walker's type in the British Museum. It was apparently distinct from *H. nyssaria*.

PLAGODIDÆ Hubner (Plate 1, fig. 27)

- Plagodia* Hubn., Ver. 94, 1818
Funanos Treits. (in part), Schin. Ent., vi. 1827
Lurigena Dup., Lep. France, vii. iv. 183, 1829
Loadypoda Steph. (in part), Noum. Ent. Fr. 44, 1829
Funanos Boisd. (in part), Gen. Ent. 187, 1830
Lurigena Dup., Cat. 229, 1844
 H. Schum. 55, 1847
Phagale Steph., Cat. Ent. Lep. 181, 1849
Funanos Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1861
 Guen. Phal. i, 144, 1857
 Walk. List Lep. Hel. Br. Mus. 156, 1860

Head much as in *Hyperctis*, rather wide in front. Palpi long, rather broad, ascending, extended well in front of the head. Male antennæ rather less heavily pectinated than in *Hyperctis*, simple in the female. Fore wings with the costa full, much as in *Hyperctis*; outer edge deeply excavated below the apex, which is either acute and much produced or nearly rectangular; below the large rounded angle in the middle, the wing is, as a rule, suddenly and very deeply excavated, the hollow being deep and rounded or shallow. Hind wings rounded at the apex; the outer edge full, slightly sinuous, with no prominent median angle; the inner angle not reaching beyond the tip of the abdomen. Venation: very similar to *Hyperctis*; a short, rhomboidal, subcostal cell, the free end of the costal vein scarcely shorter than the first subcostal venule; the disposition of the discal venules much as in *Hyperctis*.

This genus differs from *Hyperctis* in the female antennæ being simple, in the deep excavation below the middle of the outer edge of the fore wings, and in the want of a decided angle in the hind wings. In coloration, it differs in the extradiscal line being straight, not bent, sometimes being obsolete.

Larva.—Caterpillars smooth, ramiform: not flattened, having the third ring strongly swollen laterally, especially in repose, and carrying on the 8th a dorsal tubercle; head square, bilobed at the summit, flattened anteriorly; living on trees. Chrysalis red, shining, subterranean. Guenée.

Synopsis of the Species.

- Ochreous, with a purplish tint; lines oblique, but not sinuous *P. phlogosaria*.
 Like *phlogosaria*, but no inner line; and outer line broad, diffuse, sinuous *P. furcata*.
 Fore wings with the notch shallower than in the two preceding; outer line curved upward;
 beyond the wings often dark purple *P. catenaria*.
 Whitish, speckled with ochreous; a discal ringlet; median angle of the wing large and
 rounded *P. albicincta*.
 Fore wings scarcely excavated; median angle well marked; pale straw-yellow; lines
 broad, diffuse, purplish-ochreous *P. obscura*.

PELAGODIS PHLOGOSARIA Packard. Plate 11, fig. 42.

Eurygaster phlogosaria Guen., Phil., i, 116, 1857.

Walk., List Lep. Het. Bt. Mus., xx, 177, 1860.

♂.—Head, prothorax, and fore trochanters beneath violaceous. Body and wings ochreous, with a dull-greenish tinge: costa subfuscous toward the base: an inner oblique line, which is not waved, dark or reddish-brown; an outer, blackish-brown, straight line, blacker toward the inner edge of the wing: between the two lines the wing is clear: outer line shaded externally with gray scales: wing toward the internal angle with larger black strigæ than elsewhere, but no spot, with a distinct violaceous tinge: ochreous toward the apex, as in the middle of the wing: apex somewhat rounded, outer edge deeply excavated toward the inner angle: a crescent-shaped spot on the inner angle, concolorous with the lines; a well-marked discal dot. Hind wings ochreous, whitish toward the base and costa, more ochreous on the hind edge: a dark outer line, slightly sinuate, becoming obsolete toward the costa and duplicated toward the internal angle, and edged with violaceous. Beneath, ochreous: outer edge of the wing and tip of the abdomen beneath dull violaceous: costa strigated with dull violaceous: common line dull dark violaceous: apical region ochreous, toward the internal angle violaceous: inner edge whitish: hind wings more deeply ochreous, with the border uniformly pale violaceous.

Length of body, ♂, 0.44; of fore wing, ♂, 0.56, ♀, 0.56; expanse of wings, 1.20 inches.

Natick, Mass., August 5 (Stratton); Cambridge, Mass., (Putnam); Albany, N. Y. (Lintner); Michigan (Cook); "Canada" (Guenée).

The usual absence of the discal dot, the few black strigæ collected near the internal edge, and the peculiar greenish hue in the middle of the fore wings will distinguish this species from *E. ferridaria*. The antennæ are well pectinated, and the head and thorax are violaceous. One female has no bands, these being obliterated. It varies in sometimes having the discal dot and in the greenish tinge on the wings.

One male specimen is dull ochreous, with a greenish tinge, the wings being a little strigated, especially on the outer edge and on the costal edge. Head, palpi, and front of thorax with a violet tint. Inner brown line curved on the costa, straight below: discal dot large and distinct on the fore wing: outer line a little waved, dark brown, and ending on the costa at a distance

from the apex equal to half the width of the wing; a diffuse, lunate, dusky spot near the inner angle. Hind wings yellowish as usual, especially toward the outer edge; a hair-line crosses the outer third of the wing with a parallel, broad, diffuse band on the inner angle of the wing. Beneath, bright yellow-ochreous; fringe violet; two violet bands and a discal spot on the fore wing; wings more speckled than above. Abdomen beneath violaceous, and so are the legs externally. Length of body, 0.35; of fore wing, 0.50 inch.

Albany, N. Y. (O. Meske).

This species is liable to be confounded with *ferridaria*, but differs in the straight, firm, outer line, while the inner line is narrow and distinct. The shape of the wings is almost exactly as in *ferridaria*.

PLAGODIS FERRIDARIA Herrich-Schaeffer. Plate II, fig. 43.

Plagodes ferridaria H.-Sch., Ausserour, Schin., 63, fig. 203, 1850, 58.

Eurygona emarginata Guen., Phal., i, 145, 1857.

Walk., Disc. Lep. Hol. Br. Mus., xx, 177, 1860.

Eurygona cecroparia Morrison, Bull. Buff. Soc., 8, 1873.

1 ♂ and 2 ♀.—Like *phlogosaria*, but the notch in the outer edge of the fore wings is deeper than in that species; apex of the wing rectangular, the outer edge slightly convex below; hind wings with the outer edge a little more sinuous than in *phlogosaria*. Fore wings ochreous-ash, of nearly the same hue as in *phlogosaria*, but usually more strigated; inner line represented by a few scattered black scales in some of my specimens, wanting in the one figured. Discal dot small or very large and touching the extradiscal band, which is more or less sinuous, making quite an angle below the median vein; beyond the band and below the median vein, the wing is tinged with violet. Fringe concolorous with the wing, but dark in the hollow. Hind wings tinged with yellow. The extradiscal line indistinct on the costal half of the wing, with a short, external, parallel, dark line half-way between it and the outer edge (sometimes wanting); fringe dark below the median angle. Beneath pale yellow-ochreous, strigated with reddish-ochreous lines and dots; the outer line on the fore wings represented by a diffuse violaceous band, while the outer third of the hind wings is violet-purple. Head, thorax, and abdomen beneath, and basal half of costa above, tinged with violet.

Length of body, ♂, 0.15, ♀, 0.48; of fore wings, ♂, 0.55, ♀, 0.60; expanse of wings, 1.15–1.35 inches.

Brooklyn, N. Y. (Morrison); New Jersey (Sachs).

This species, so closely allied to *P. phlogosaria*, differs from that in the want of an inner line, and in the outer line being more or less sinuous. The specimen figured is the type of Mr. Morrison's *occurrearia*, and is in a fresher state than the others, consequently the strigæ are larger and thicker; the outer line is more sinuous than in the other two; but I cannot see any good reasons for separating it from Herrich-Schæffer's species, which is well figured.

PLAGODIS KETZINGARIA Grote. Plate 11, fig. 44; plate 13, fig. 51.

♂ *♀* and *larvæ*.—Body ochreous; head and base of the costa and sternum lilac. On the basal third of the fore wings, a brown-ochreous diffuse band, outer edge curved; no discal dot or strigæ (except obscure diffuse ones on costa) on the middle of the wing; on the outer third of the wing, a dark-red band curved inward, and edged diffusely within with brown-ochreous, which is powdered thickly with grayish scales, especially toward the inner angle. Outer edge very deeply excavated, brownish at inner angle, growing paler toward the middle of the wing. Hind wings clear pale ochreous on the basal two-thirds, with a few minute, scattered strigæ, with a dark, straight stripe near the inner angle, which proceeds but a short distance toward the middle of the wing. Blackish strigæ on a light ground at the inner angle of the hind wings. Externally the wing is lilac, becoming ochreous toward the costal edge. Legs ochreous; abdomen lilac beneath.

♂ *♀*: Length of the body, 0.45; of fore wing, 0.60; expanse of wings 1.30 inches.

Cambridge, Mass., May 23 (Morrison); "Cambridge, May 6" (Coll. Harris, Bost. Soc. Nat. Hist.); Albany, N. Y. (Lintner); Ithaca, N. Y. (Comstock); New York (Grote); Maryland (Mus. Peab. Acad. Sci.).

This species is easily known by the want of the usual transverse strigæ, being plain ochreous on the middle of the wing, without any discal dot; outer edge and base brown, and deeply tinged with lilac and gray. The antennæ are well pectinated. The outer line is nearer the middle of the wing than usual, and is curved inward, while in other species it is nearly straight. Beneath yellowish ochreous, thickly strigated with an outer, diffuse, violaceous band, and outer edge of hind wings violaceous. In the specimen figured on plate 13 (fig. 51), the outer line is situated within the middle of the wing, and all beyond is dark blackish-purple on both wings.

PLAGODIS ALCOOLARIA Packard. Plate 11, fig. 14.

Eurymen alcoholaria Guen., Phal., v, 116, 1857.

Walk., List Lep. Het. Br. Mus., 178, 1860.

1 ♂ and 4 ♀.—Body and wings with a slight ochreous tinge. Fore wings with the apex obtuse, subrectangular; the median angle large, rounded; the edge below this angle regularly and deeply excavated, not suddenly, as in *P. ferridaria*; hind wings with the outer edge rather more sinuous than usual. Fore wings whitish, rather thickly speckled with ochreous and reddish-ochreous scales, arranged in a diffuse, broad, slightly but regularly curved, basal line situated on the inner third of the wing. A large, reddish-yellow, discal ringlet. A considerable distance beyond is the extradiscal line, which is broad, oblique, slightly sinuous, reddish within, shaded externally with dull lead-color. The wing is a little clearer beyond this line and within the basal line. A dark, deep, rust-red thread-line on the edge of the wing. Fringe pale, dark in the hollow below the median angle. Hind wings white, with scattered deep-ochreous strigæ near the inner angle, with a straight, dark, rust-red line, most distinct on the inner edge, and fading out toward the middle of the wing. Beneath bathed with ochreous and densely strigated, especially on the hind wings. An outer ochreous line common to both wings. Legs ochreous.

Length of body, ♂, 0.53, ♀, 0.50; of fore wings, ♂, 0.65, ♀, 0.65; expanse of wings, 1.35 inches.

"Canada" (Guénée); Essex County, Vt. (Cassino); Boston, Mass. (Sanborn); Amherst, Mass. (Goode); Ithaca, N. Y. (Comstock); New Jersey (Sachs); Maryland (Mus. Peab. Acad. Sc.); "New York and West Canada" (Walker).

PLAGODIS SERINARIA Packard. Plate 11, fig. 15.

Epione serinaria Guen., Phal., i, 98, 1857.

Walk., List Lep. Het. Br. Mus., xx, 120, 1860.

2 ♂ and 1 ♀.—Body and wings straw-yellow; body more ochreous than the wings. Front of the head with some pinkish scales in the center, with ochreous sides; breast pinkish; palpi very stout, thick, deep ochreous; third joint very acutely conical, passing beyond the front. Antennæ rather stoutly pectinated, ochreous throughout; wings shaped much as in *P. bentzen-garia*; outer edge sinuate, not excised below the apex, which is square, with a broad sinus below the middle, which is not excavated so much as in the other

species: uniformly pale ochreous: a single outer, broad, rather diffuse, dark-ochreous, sinuate band nearer the margin than usual; more distinctly marked at each end on the inner margin and costa than in the middle. Fringe concolorous with the rest of the wing. Hind wings pale testaceous-whitish, with a short, abbreviated, fuscous, geminate line on the inner angle, giving rise to a transverse, nearly straight, ochreous line. Beneath pale straw-yellow; the lines re-appear beneath.

Length of the body, ♂, 0.54. ♀, 0.50; of fore wing, ♂, 0.70. ♀, 0.75; expanse of wings, 1.50–1.60 inches.

Brunswick, Me., July (Packard): Essex County, Vt. (Cassino): New York (Grote).

This species differs in its larger size, stout, well-pectinated antennæ, the pale ochreous wings, without the usual strigæ and discal dot, the uniform straw-yellow wings, and the single, dark, ochreous, broad, rather diffuse, slightly sinuate line: in the pinkish front and pectus, while the outer edge of the wing is less sinuate than usual. It is mentioned on page 21 under the name of *Eurymene unitaria*.

NEMATOCAMPA Guenée. Plate 5, fig. 10.

Nematocampa Guen., Phal., i, 120, 1857.

Walk., List Lep. Het. Br. Mus., xx, 147, 1860.

Head rather narrow in front; palpi long, ascending, extending well in front of the head; male antennæ very thick, not pectinated; in the female, slender, simple. Fore wings unusually short and broad; costa fuller than usual; apex rectangular; outer edge bent in the middle, deeply excavated on each side of the angle in the female. Hind wings rounded at the apex, with a distinct angle in the middle, reaching as far as the end of the abdomen, which is slender, ending in a long tuft. Hind tibiae much swollen; tarsi a little less than one-half as long as the tibiae. Venation: but five subcostal veins; no subcostal cell; costal vein anastomosing with the subcostal. Posterior discal vein very oblique; the first and second median veins nearly co-originating, not so remote at their origins as in *Hyperctis* and *Plagodis*. Coloration: silvery-ochreous, with numerous brown, irregular, fine lines; the veins brown, and the margin of both wings more or less suffused with ochreous-brown.

The small size of the single species known, its peculiar style of color-

tion, and its thick but simple male antennae separate this genus from *Hypocretix*, to which it is closely allied in the form of the wings.

Larva.—Rather thick, ramiform.; head as wide as the body, which is provided with two pairs of long, curved, dorsal filaments arising from the middle of the body. Pupa thick, conical.

NEMATOCAMPA FILAMENTARIA Guenée. Plate 11, fig. 46; larva and pupa, plate 13, figs. 8, 8*a*.

Nematocampa filamentaria Guen., Phal., i, 150, 1857.

Microgona restituta H. Sch., Ausserenr. Schin., 11, fig. 368, 1850-58.

Nematocampa resistaria Walk., Last Lep. Hel. Ent. Mus., xx, 117, 1860.

Nematocampa filamentaria Pack., Guide to Study of Insects, 320, plate 8, figs. 7, 7*a*, 1869.

Nematocampa expunctaria Grote, Can. Nat., iv, 101, 1872.

8 ♂ and 2 ♀.—Pale ochre, with brown veins and transverse strigæ; a brown inner line, much curved. An outer sinuate line, with a supplementary line just inside, touching the outer line on the submedian vein and in the extradiscal space, and forming a large circle, one side of which touches the outer line. Beyond the line, the border of the wing is dull brown, with the apical region clear. Hind wings streaked transversely as on the fore wing, with the outer third brown, apex included. Beneath much paler; veins not colored; wings speckled and the markings the same as above, but faint; outer edge of hind wings pale yellow, either with or without traces of outer line.

Length of body, ♂, 0.28–0.33; of fore wing, ♀, 0.35–0.45; expanse of wings, 1.00 inches.

Montreal, Canada (Lyman); Brunswick, Me. (Packard); Albany (Lintner and Meske); Salem, Mass., June 28 (Packard and Sanborn).

I am led, from the description, to regard *N. expunctaria* as a variety of this variable species. This is probably *Macaria limbata* Wood, Index Entomologicus, 166, fig. 743 *n*, 1839.

Larva.—Body cylindrical; head large, with two unequal pairs of long, slender, fleshy filaments, situated on the third and fifth abdominal rings, the posterior pair shorter than the others, curled at the end and finely tuberculated. Head pale rust-red, marbled with a still paler line. Head full on each side of the median line, flattened in front. Half-way between the meta-thoracic legs and the first pair of filaments are two subacute tubercles, which are rust-red; when the four filaments are uncurled, they are as long as from

the head to the tubercles. The anterior pair of filaments are pale rust-red beneath at base, brown above, but tipped with white. A distinct dorsal line from the prothorax to the second pair of filaments: a pair of small tubercles next to the last segment, tipped with pale rust-red. Body wood-colored above and beneath: thoracic rings greenish above, succeeded by pale rust-red between the tubercles and first pair of filaments: behind these, variously marked with light and dark brown. An oval dark spot behind the last pair of tubercles and extending into the anal plate. Anal legs rusty, lined above with a whitish line. Length, 0.70 inch. It feeds on the strawberry and currant in June.

Pupa.—Body rather thick, conical, pale horn-brown, slashed and speckled with dark brown. The pupa appeared in Salem, June 17. Length, 0.40 inch.

CAULOSTOMA Lederer. Plate 5, fig. 13.

Therapis Hubn. (in part), Verz., 287, 1818.

Ennomos Treits. (in part), Schm. Eur., vi (i), 3, 1827.

Philobia Dup. (in part), Lep. France, vii (iv), 195, 1829.

Ennomos Böisd. (in part), Gen. Ind., 182, 1840.

Therapis H.-Sch. (in part), Schm. Eur., iii, 49, 1847.

Caulostoma Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1853.

Guen., Phal., i, 110, 1857.

Walk., List Lep. Het. Br. Mus., xx, 138, 1860.

Head moderately broad in front: palpi stout, porrect, not ascending, reaching well beyond the front. Antennae in the male well pectinated. Fore wings with the costa and apex much as in *Angerona*, but the apex a little more obtuse: outer edge a little less bent than in *Angerona*, not being excavated below the apex. Hind wings full, not excavated below the apex, as in *Angerona*, and with the apex more rounded. Venation: much as in *Angerona*, but there are only five subcostal veins, while the venules are proportionately longer, and the subcostal cell is shorter, while the two discal venules form a shorter and less curved line. The hind legs are long and slender, the tibiae scarcely swollen, and the tarsi long, being much as in *Angerona*. In the style of coloration, while *Caulostoma* is ochreous, it is much duller than *Angerona*, and from the four brown costal spots our single species would be easily mistaken for a species of *Thamnonoma*, being closely allied in its general style of coloration and appearance to *T. flavicaria* and *alphavina*.

CAULOSTOMA OCCIDENTARIA Packard

Caulostomat occidentaria Pack., Sixth Rep. Peab. Acad. Sci., 52, 1-54

♂.—This interesting species, the first of the genus known to inhabit the American continent, and the second species known, differs from *C. flavaria* of Europe in the rather broader wings, both pairs being much less excavated on the outer edge. The antennae are much the same, and the markings similar in the two species. Body and wings deep lemon-yellow. Fore wings with four nearly equidistant, large, conspicuous, brown, costal spots. From the third arises a broad, diffuse, sinuous, brown shade, extending on to the hind wings, and forming a slightly-curved median band. Fringe concolorous with the wings: apical half of fore wings brown, checkered slightly with brown on the hind wings. Beneath speckled slightly with brown. Four faint discal spots. Two outer costal spots only present: from them arise two faint bands, interrupted by the venules. A single outer line on the hind wings about half-way between the discal spot and the outer edge of the wing.



Length of body, ♂, 0.50; of fore wing, 0.70; expanse of wings, 1.50 inches

Oregon (Hartford): Colorado Territory (Ridings): Denver, Colo., June 3 (Mead): Dakota Territory (Mus. Comp. Zool.).

The line on the hind wing is less curved in the Oregon specimen than in that from Colorado, and the latter is deeper yellow. The occurrence of this genus on the Pacific slope of the continent is extremely interesting as a link connecting the insect fauna of Western America with Eastern Europe.

It differs from the European *C. flavaria* in having broader wings, both pairs being much less excavated on the outer edge. The antennae are much the same, and the markings similar in the two species. *C. flavaria* is reported in Standinger's Catalogue as occurring in Galicia, Hungary, Southern and Eastern Turkey, Middle Russia, and Armenia.

ANGERONA Duponchel. Plate 5, fig. 15.

- Ennomos* Treits. (in part), Schm. Ent., vi (r), 3, 1827.
Angerona Dup., Lep. France, vii (ix), 180, 1829.
 H. Sch., Schm. Ent., iii, 63, 1847.
 Steph., Cat. Brit. Lep., 167, 1850.
 Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1853.
 Guen., Phal., i, 141, 1857.
 Walk., List Lep. Het. Br. Mus., xx, 141, 1860.

Head rather broad in front, closely scaled. Palpi slender, porrect; outer third of second joint surpassing the front; third joint minute, pointed acutely. Antennae pectinated; in female subsimple. Thorax rather slender. Fore wings with the costa straight. Apex obtuse, rectangular, more acute in the female; outer margin bent slightly in the middle, not angulated; below much rounded; in the female with the apex more produced, acute. Venation: The subcostal cell is long and narrow; six subcostal venules, the two discal venules together forming a deeply-curved line. Hind wings broad; internal angle rectangular, passing beyond the tip of the abdomen. Apex acute, especially in the female, outer margin excavated below the apex, two-toothed, much produced above the middle, convex, not angulated. Legs rather slender; hind tibiae hardly thickened, female as much so nearly as the male; spurs thick, obtuse, of moderate length; tarsi three-fourths as long as the tibiae. Abdomen short and slender, compared with the great expanse of the wings. Anal tuft slight. Coloration: yellow; two costal ochreous spots. A subinternal, oblique, broad band, continued on to the costa of the hind wings, and re-appearing on the internal margin. Surface dotted with ochreous specks.

This genus differs from *Epione* in the more obtuse apex, the slight bend in the outer edge of the wing, and in the female antennae being subpectinated.

Larva.—The body gradually increases in size to the segment bearing the first pair of abdominal legs; the head is flattened so as to be square above. Body smooth. Pupa of the usual form.

ANGERONA CROCATARIA. Plate 11, fig. 52; larva, plate 13, fig. 9.

- Phalana crocataria* Fab., Suppl. 146.
Therapis citrinaria Hübn., Beiträge, figs. 499, 500, 1825.
Angerona crocataria Guen., Phal., i, 157.
 Walk., List Lep. Het. Br. Mus., xx, 1860.
 Pack., Guide to Study of Insects, 319, pl. 8, fig. 5, larva, 5 a, 1869.

8 ♂ and 4 ♀.—Bright ochre-yellow. Body concolorous with the wings; antennae with yellow scales; front yellow; palpi yellow, spotted with pale

brown, like the legs. Fore wings spotted with pale brown, and crossed by two broad, broken, light-brown lines: the inner on the inner quarter of the wing curved and consisting of about three spots, one on the costa, one on the inner margin, one on the median vein (the middle one often wanting). Outer line curved, often forked on the first median cell, sending a smaller branch straight toward the apex: this branch often obsolete, and the whole line obsolete in the middle of the wing, and sometimes wanting on the costa. The same line is continued on to the hind wing: it is usually obsolete in the middle of the wing. No inner line on the hind wing. Fringe yellow, spotted with brown at the ends of the venules. Beneath as above.

Length of body, ♂, 0.75; of fore wing, ♂, 0.68–0.85, ♀, 0.95–1.06; expanse of wings, 2.00–2.20 inches.

Iowa, June 18–20 (Professor Parker); Brunswick, Me., June (Packard); Massachusetts, (Sanborn and Peab. Acad. Sc.); Illinois (Clemens); New Hampshire (Walker); Detroit, Mich. (Mus. Comp. Zool.); New Orleans, La. (Mus. Peab. Acad. Sc.); abundant at head of Plum Creek, Colo. (Lieutenant Carpenter, Hayden's Survey).

A common form, at once known by the bright ochre-yellow wings, its large size and broadly pectinated male antennæ. The wings vary much in the extent of the spots and bands.

One male specimen from Philadelphia (Ent. Soc.) is almost immaculate, with unusually broad hind tibiae, also unspotted.

Larva.—The body gradually increases in size to the segment bearing the first pair of abdominal legs. The head is flattened so as to be square above, and is whitish-green, with three longitudinal brown lines. The prothoracic ring is concolorous with the head, from which two brown lines extend, forming an inverted v on the hinder edge. The body is pale grass-green above, with the sides swollen. There are four minute black dots on each segment: a whitish, indistinct, subdorsal line, and a lateral white line extending to the sides of the anal legs. It feeds on the strawberry and currant in June, entering the pupa state June 12. The moth appears at the beginning of July.

OPISTHOGRAPTIS Hübner. Plate 6, fig. 5.

- Opisthograptis* Hübner, Verz., 292, 1815.
Limonas Treits., Schin. Eur., vi (1), 3, 1827.
Rumia Dup., Lep. France, vii (xv), 117, 1829.
 Boursd., Gen. Ind., 182, 1840.
 Dup., Cat., 216, 1844.
 H. Sch., Schin. Eur., iii, 51, 1847.
Opisthographus Steph., Cat. Br. Lep., 168, 1850.
Rumia Loeblerer, Verh. Bot. Zool. Ges. Wien, 176, 1853.
 Graven., Phil., i, 108, 1857.
 Walk., List Lep. Het. Br. Mus., xx, 137, 1869.
Hesperumia Pack., Proc. Bost. Soc. Nat. Hist., xvi, 37, 1874.
 Pack., Fifth Rep. Penb. Acad. Sci., 79, 1874.

Head, body, and palpi as in *Sicya*. Male antennae more heavily pectinated than in *Sicya*; in the female simple. Fore wings triangular, the costa straight; apex subrectangular, the outer edge long, oblique, without any angle in the outer edge. Hind wings large and full; outer edge full and rounded, with a slight sinus just before the middle of the outer edge; they reach a little beyond the end of the abdomen. Venation: costal vein anastomosing with the subcostal. Six subcostal venules, the first very short, one-half as long as the second, and co-originating with the first from a common branch; the third and fourth originating from a common branch; no subcostal cell. The independent vein is situated rather nearer the sixth subcostal vein than usual; the anterior discal venule being short, while the posterior one is oblique, but not much curved. Male hind legs much as in *Sicya*; the tibiae are very slightly swollen; the tarsi about one-fourth shorter than the tibiae. Coloration: straw-yellow, with no markings except three costal spots, the middle one of which connects with a very large oval discal spot.

This genus differs from *Sicya*, *Antepione*, and *Heterolocha* in the fore wings being entire, not falcate, the outer edge regularly convex, not excavated, and the hind wings rounded, not angular on the outer edge, and having a faint sinus below the apex. It is more closely allied to *Angerona* than any other American genus of this subfamily, being like that genus in the entire fore wings and in the sinus in the hind wings. The fore wings are a little pointed at the apex, and less angulated in the middle of the outer edge. The subcostal venules are shorter, sent more directly to the costa, and the costal interspace narrower. Hind legs as in *Angerona*, the spurs of the same relative size. The female is smaller than the male, while in *Angerona* the female is considerably larger than the male. At first regarding our species as generi-

cally distinct from the European *R. crataegata*, on reconsideration after the first examination I see no reason for separating our species from the latter.

Larva.—Caterpillars ramiform, thickened posteriorly, having, besides the ordinary ventral feet, two other shorter pairs not used; with lateral fibrous appendages in the form of fringes on the two last pairs; living on shrubs. Chrysalides contained in thick, dense cocoons spun on the branches." (Gueneé.)

OPISTHOGRAFTIS SULPHURARIA Packard. Plate II, fig. 47.

Hesperanaut sulphuraria Pack., Little Rep. Peab. Acad. Sc., 79, 1871.

Hesperanaut ochracea Pack., Proc. Bost. Soc. Nat. Hist., xvi, 37, 1871.

6 ♂ and 4 ♀.—Body and wings deep sulphur-yellow; sides of the head and palpi ferruginous; antennae dark ochraceous; on the fore wings is a ferruginous, incomplete, basal, curved line, largest on the costa; a diffuse, slightly sinuate line passing just outside and partially inclosing the very large, orbicular, brown, discal ring, irised with yellow; an outer, submarginal, broadly sinuate line, more distinct than the inner two, diffuse, dilated on the nervules, and especially on the costa; within and along the outer edge are a few transverse ferruginous strigae; fringe ferruginous. Secondaries very pale toward the base, with a few strigae toward the outer edges; no lines or discal dot. Beneath, the wings are clear, with sparse irrorations on the costal and outer border of the wing, and the discal dot is a round obscure spot, smaller than above and centered with yellow—a single wedge-shaped mark on the outer fourth of the costa marks the site of the outer line. Fringe dark brown as far as the inner angle of the fore wings, pale on the secondaries, concolorous with the rest of the wing.

Length of body, ♂, 0.48–0.55, ♀, 0.50; of fore wing, ♂, 0.66–0.72, ♀, 0.62; expanse of wings, 1.30 inches.

Streaked Mountain, Paris, Me., July 22 (S. E. Smith, Mus. Yale College); Sierra Nevada, Cal., and Nevada (Edwards); Clear Creek Cañon, near Golden, Colo., July 3, common among the grape-vines on the banks of Clear Creek; Manitou, Colo., July 16 (Packard, Hayden's Survey).

It may be recognized at once by the unusually large brown ring, purpled with yellow, by the two mesial bands, which approach each other on the costa and hind edge, and by the brown fringe on the fore wings becoming

yellow at the hind angle and margin. The species varies in the distinctness of the lines and discal spots.

Without suspecting at the time of describing the Pacific-coast and eastern specimens that they belonged to the same species, I did not bring them together, but on careful comparison I see no reason for separating them. The Californian specimens (length of fore wing, ♂, 0.72 inch) are a little larger than the Maine examples (length of fore wing, 0.66 inch).

HETEROLOCHA Lederer. Plate 5, fig. 12.

Heterolocha Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1853.

H.-Sch., Suppl. Schm. Eur., 1850-58.

Guen., Phal., 105, 1857.

Walk., List Lep. Het. Br. Mus., xx, 135, 1860.

Male antennæ plumose, the pectinations being much longer than in *Sicya*; in the female, well pectinated, about one-third shorter than in the male. Head a little wider and fuller than in *Sicya*. Palpi as in *Sicya*. Fore wings subfalcate, much as in *Sicya*, but slightly less excavated below the apex, especially in the female. Hind wings much as in *Sicya*, but rather fuller and rounder, less angulated. Venation: but one subcostal cell; discal venules much less oblique, otherwise as in *Sicya*. Hind legs as in *Sicya*, the tibiae not being swollen, and the tarsi long and stout. Coloration: yellow, with a scalloped outer line, the edge of the wing beyond brown; but in the hind wings the outer margin is not discolored.

Sicya being the better known form, I have made that genus the standard of comparison with this. In the form of the body and the shape of the wings, the two genera are closely alike; the chief difference between them being that the female antennæ are well pectinated in *Heterolocha*, but in *Sicya* they are simple, while the fore wings are a little less excavated and the hind wings less angular in *Heterolocha*, the differences being most apparent in the females.

HETEROLOCHA EDWARDSATA Packard. Plate 11, fig. 48.

Heterolocha edwardsata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 383, 1871.

5 ♂ and 6 ♀.—This very interesting species evidently is an aberrant form of this genus of Lederer's. The head agrees with that of *Antepione*; the form of the wings is a mean between *Opisthograptis* and *Antepione*. The wings seem to be more falcate and the outer edge more oblique than in the

other species described; and in our species, the usual line on the hind wings is wanting, approaching *Opisthograpta* in that respect. The male antennae are very broadly pectinated, the branches suddenly shortening on the outer quarter, the tip being filiform; the female antennae are moderately pectinated, the tip being filiform. The hind wings are not so produced and rounded toward the apex as in *Antopione*, though more so than in *Opisthograpta*; mesial tooth slightly marked.

The head is yellow, with reddish-pink orbits and palpi. Body yellow, and wings of the same color, the hind wings being unmarked, a little paler. The fore wings with a distinct discal dot and a single, oblique, outer, scalloped line, going obliquely from the outer quarter of the inner edge to the costa just before the apex; beyond this line, the wing is more or less stained with brown; the fringe is yellow, slightly stained with dark brown below the apex; the under side of the wings is sparsely scattered with minute brown scales. Beneath are two subapical lines, forming a v; the fringe is brown, and the wings more speckled than above; discal dots larger than above.

The female differs in its much larger size, and in the inner line being present, forming an unusually broad, diffuse, brown band, interrupted by the veins and angulated in the median space; the outer edge of the wing reddish-brown beyond the oblique, scalloped line, the wing becoming more yellowish on the edge, and the fringe dark brown from the apex to the median angle. The scalloped line re-appears distinctly beneath; discal dot large; several other brown flecks are scattered over the middle of the wing.

Length of body, 0.50; of fore wing, ♂, 0.70, ♀, 0.65; expanse of wings, 1.60 inches.

California (Edwards, Behrens).

Dedicated to Mr. Henry Edwards, who has been the first to discover the genus in North America.

SIENNA Guenée. Plate 5, fig. 14.

Sienia Guen., Phal., i, 101, 1857.

Walk., List Lep. Het. Br. Mus., xx, 133, 1860.

Male antennae not very heavily pectinated; entirely simple in the female. Front of the head rather narrow, moderately full. Palpi slender, perfect, extending as far as the front. Fore wings with the costa slightly convex,

subfalcate; the apex subacute, the outer edge being deeply hollowed out below; the angle of the outer edge nearer the apex than usual. Hind wings with a well-pronounced angle in the outer edge; the apex well rounded. Venation: two subcostal cells, the inner small, rhomboidal; the subcostal venules very short; the two discal venules together forming a deeply-curved line. Hind tibiae not thickened; tarsi long and rather stout. Coloration: yellow; an extradiscal straight line on the fore wings, beyond which the wing is discolored on the lower half with pale flesh-brown; and the entire outer edge of the hind wings is similarly discolored.

This genus may be known by the fore wings being suddenly excavated below the subacute falcate apex, and by the angle in the outer edge being situated much nearer the apex than usual, as well as by the distinct angle in the hind wings.

SICYA MACFLARIA Harris. Plate 41, figs. 50, 51.

Sicya macularia Harris!!!, Agassiz, Lake Superior, 392, pl. vii, fig. 3.

Sicya truncataria Guen.!!!, Phal., i, 104, 1857.

Sicya solfataria Guen., Phal., i, 104, 1857.

Sicya sublimaria Guen.!!!, Phal., i, 105, 1857.

Sicya truncataria Walk.!!!, List Lep. Het. Br. Mus., xx, 133, 1860.

Sicya solfataria Walk.!!!, List Lep. Het. Br. Mus., xx, 134, 1860.

Sicya macularia Walk., List Lep. Het. Br. Mus., xx, 134, 1860.

Sicya crocearia Pack., Proc. Bost. Soc. Nat. Hist., xvi, 35, 1871.

1 ♀, described from Harris's type, from Lake Superior.—Bright sulphur-yellow. Body yellow. Front of head tinged with orange. Fore wings sulphur-yellow; costa fawn-colored at base; inner line composed of irregular, fawn-colored spots, widest on the hind edge, bent at right angles on the costa, straight in its course, and parallel to the outer line, which is also interrupted between the large fawn-brown patch and the apex, there being below the costa two brown dots, representing the line, and a pre-apical, costal, brown spot; below the first median venule, the line, brown and paler within, is waved more than in the normal form, and the fawn-colored patch between the line and the outer edge is rather shorter and broader than usual; the fringe is white opposite the brown portion and yellow above, interrupted by brown spots; a slight discal dot, and a few fawn-colored, faint flecks along the costa and in the middle of the wing. Hind wings with a large discal dot; the outer line terminates opposite the discal dot; beyond it the wing is pale fawn-brown, deepening at the internal angle, the patch not extending beyond

opposite the discal dot. Beneath, the hind wings are pale sulphur yellow, like the fore wings, and the markings all re-appear, but the discal dots and flecks are larger and costal end of the outer line on the fore wing is waved, and much more distinct. Legs yellowish, tinged irregularly, and banded with pale fawn-color.

Length of body, 0.50; of fore wing, 0.65; expanse of wings, 1.35 inches.

The hind wings are more angulated than usual, and the fringe of both wings more decidedly scalloped. Harris says: "The male has pectinated antennae and a long tongue."

2 ♂.—The following description applies to the specimens from the Eastern States:

Bright sulphur-yellow; abdomen and hind wing paler. Front of the head yellowish; orbits and palpi orange. Fore wings bright straw-yellow, unspotted. Basal third of the costa above and beneath edged with reddish-brown. An oblique, straight, brown, inner line bent at right angles on the costa. A small, brownish, discal dot, paler on the hind wings. Outer line oblique, nearly parallel with outer edge of wing, slightly sinuate, ending a little before the apex; dark brown fading out on the outside, and spreading out triangularly (as if split) on the costa. The space between this line and the outer edge is pale brown on the hinder three-quarters of the margin, sulphur-yellow toward the apex, which is tipped minutely with brown. Fringe yellowish, whitish opposite the brown portion. Hind wings yellowish-white, beyond the outer, sinuate, reddish-brown line washed with brown, though much paler than on the fore wings. Beneath as above; outer line broader, crinkled on the costa, and with a decidedly reddish-brown edge, though paler than above. Legs broadly banded with pale brown.

Length of body, ♂, 0.45; of fore wing, 0.62 inch.

Bridport, Vt. (Putnam); White Mountains, early in August (Scudder); Mount Washington, N. H. (Mus. Peab. Acad. Sc.); Albany, N. Y. (Meske).

The following description applies to the Pacific-coast specimens, of which one is represented on plate 11, fig. 51:

Sulphur-yellow; palpi and orbits deep reddish-orange; thorax sulphur-yellow, concolorous with the primaries; hind wings pale yellow, a little deeper than the abdomen. Primaries crossed by two light-brown lines, the inner (often obsolete) oblique, scarcely curved, and bent at right angles on the

costa: the outer runs straight from just beyond the middle of the inner edge of the wing to the costa, on which it forks, ending just before the apex; beyond this line, the wing is pale fawn-brown, the apical region clear yellow. Hind wings with a single, sinuate, reddish or brown line, beyond which the wing is tinged with reddish, while within the line it is inclined to be whitish. Beneath whitish-yellow, the primaries more yellow than the secondaries; the outer line a broad reddish-orange band, with the wing beyond tinged with the same color, the apical region yellowish; a brown or paler curved line on the hind wings, with a few brown flecks beyond, though these are often wanting. Legs pale, a little darker at the ends of the tibiae, or broadly ringed with dark brown.

Length of body, ♂, 0.45, ♀, 0.35–0.50; of fore wing, ♂, 0.55, ♀, 0.47–0.72; expanse of wings, 1.50 inches.

California (Edwards and Behrens); Nevada (Edwards).

The inner line is often obsolete, or represented by a few spots; the outer varying in depth of color, usually but little darker than the brown portion beyond. Hind wings sometimes yellowish, with a brown line. A large female from California, received from Mr. Behrens, differs from the others in having the outer line on the fore wings obsolete between the median vein and the costa, the lines brown, and the hind wings more yellowish and speckled with brown scales.

In a single male specimen from California, the costa of the fore wings is arched, the wings being much broader and fuller, with a distinct, dark, triangular, costo-apical spot, while the base of the costa is reddish, the secondaries much more rounded, and the line nearer the middle of the wing and distinctly scalloped, but I judge the three forms to be simple local varieties, as the markings vary considerably in this genus. The five Nevada individuals are smaller than the others, and with narrower wings.

Upon a careful comparison of all the specimens from all parts of the country, I see no reason for not considering that all of Guenée's and my own species are variations of a single species, and have, since seeing Guenée's and Walker's types, been led to this determination. Guenée's *S. solfataria* is certainly equivalent to his *truncataria*. Harris's type of *macularia* differs more than any of the others except one. One White Mountain and a Californian specimen are of the same size, and with markings almost identical. I do not see any good reason for Guenée's dropping Harris's name *macu-*

laria, and substituting *sublimaria* for it because *macularia* has been used for a species of "*Ennomula*", so long as it has not been used in the genus.

ANTEPIONE, *gen. nov.* Plate 5, fig. 46.

Epione Grote, Proc. Ent. Soc. Phila., iii, 20, 1864.

Head a little wider in front than in *Sicya*, and rather more square than in *Heterolocha*; hairs on the front projecting more than usual. Palpi longer than in those genera, extending farther than usual beyond the front; they are large, stout, ascending, and the third joint large and very distinct. Male antennae thick, compressed, simple; in the female slender and simple. Fore wings rather short and broad, the costa slightly convex; apex falcate, especially in the female, regularly excavated below the apex, not so suddenly so as in *Sicya*; a well-marked angle in the middle of the outer edge. Hind wings with an unusually large angle, much more prominent than in *Sicya*, extending slightly beyond the end of the abdomen. Venation: costal vein anastomosing with the subcostal; the first four subcostal venules equal in length; a long, narrow, subcostal cell; the discal venules together forming a curved line. Hind legs with the tibiae swollen: tarsi two-thirds as long as the tibiae. Coloration: deep yellow, with a large costo-apical brown spot, and the edge of both wings often brown, sometimes clear.

This genus differs from *Sicya* and *Heterolocha* in the simple antennae, the well-angulated hind wings, subfalcate fore wings, and swollen hind tibiae. It differs from *Epione* by the simple antennae, the entire hind wings, which are not excavated in front of the median angle as in *Epione*, while the fore wings are more falcate.

Synopsis of the Species.

Wings deep yellow at base, brown on the outer half.....*A. depontanata*,
Body and wings uniformly light yellow; a costo-apical spot, and another opposite on the
inner edge of the fore wing.....*A. sulphurata*

ANTEPIONE DEPONTANATA Packard. Plate 11, fig. 55.

Epione depontanata Grote, Proc. Ent. Soc. Phila., iii, pl. 2, fig. 7, 1864.

3 ♂.—Body and wings yellow; head in front and tips of the palpi brown. Fore wings bright straw-yellow on the basal two-thirds; a basal brown line curved outward toward the small discal dot, and again below the

median vein. The extradiscal line runs from the triangular costo-apical spot to near the middle of the inner edge of the wing, and merges into the brown margin of the wing. The triangular costo-apical spot is edged with deep reddish-brown. Hind wings yellow to a little beyond the middle, with a distinct discal spot; beyond brown, as in the fore wings; beneath bright yellow, mottled with brown; fore wings brownish on the outer third, but mottled more or less with yellow, a diffuse extradiscal band being left, and a submarginal row of dark spots; a similar arrangement on the hind wings, but less marked, the wing externally being more yellow.

Length of body, ♂, 0.53; of fore wings, 0.65; expanse of wings, 1.35 inches.

Brooklyn, N. Y. (Graef); West Farms, N. Y. (Angus); Glencoe, Nebr. (Dodge); New Jersey (Sachs); Maryland (Mus. Comp. Zool.).

This well-marked species differs from the other in the hind wings being a little less angular, and in the outer third (nearly one-half) of both wings being brown.

ANTEPIONE SULPHURATA Packard. Plate 11, fig. 56.

Heterolocha sulphuraria Pack., Fifth Rep. Peab. Acad. Sc., 79, 1873.

2 ♀.—Uniformly sulphur-yellow above and below, the outer edge of the wings not being brown, as usual. Head and palpi brown, rest of the body sulphur. Legs brown. Fore wings with the basal third of the costa brown on the extreme edge. Inner line obsolete; a few minute, pale, reddish-brown spots indicating its site. Outer band consisting of two brown spots on the inner edge of the wing, forming a two-scalloped short band, reaching to the third median venule, the inner edge being deeper brown; two or three scattered, diffuse spots (or none) connect the band with the subapical, costal, large, triangular spot, which is either brown, or with paler scales (white and yellowish) in the center. Minute brown flecks forming an obscure line (wanting in one specimen) midway between the outer line and the edge of the wing. Fringe on both wings yellow, with a brownish hair-line at the base. Hind wings clear, except an obsolete transverse band indicated by a double, brown, abbreviated line at the outer third of the inner edge. Beneath more spotted than above. Outer line with a large patch in the middle of the wing; discal dot minute. This species (as also another from the Middle States, which differs in having the outer edge of both wings broadly bordered

with brown, but with the large triangular costo-apical spot present, though the specimen (from Clemens's collection) is too imperfect to be farther characterized) has unusually-angulated wings, the hind wing being produced into a decided tail.

Length of body, ♀, 0.55; of fore wing, ♀, 0.70; expanse of wings, 1.15 inches.

West Farms, N. Y. (J. Angus); Middle States (Ent. Soc.); Kansas (Snow).

EPIONE Duponchel.

Euchloria Hübn. (in part), 293, 1818.

Ennomos Treits. (in part), Schm. Eur., vi (i), 3, 1827.

Epione Dup. (in part), Lep. France, vii (iv), 211, 1829.

Bradypetes Steph. (in part), Nomencl. Br. Ins., 44, 1829.

Ennomos Boisd., Gen. Ind., 182, 1840.

Epione Dup., Cat., 222, 1844.

H.-Sch., Schm. Eur., iii, 48, 1847.

Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1853.

Guen., Phal., i, 95, 1857.

Walk., List Lep. Het. Br. Mus., xx, 117, 1860.

Larva.—"Caterpillars ramiform, but without protuberances, with the 4th ring enlarged; head small and flattened; living exposed on trees. Chrysalides moniliform, reddish brown, very lively, contained in a network of silk between leaves."—(Guenée.)

EPIONE MOLLICULARIA Zeller. Plate 11, fig. 57.

Epione mollicularia Zeller !!!, Verh. Bot. Zool. Ges. Wien, 481, 1872.

2 ♂.—Body deep yellow; head and palpi dull pinkish. Fore wings pinkish-brown on the basal third, limited by the inner line, which is much curved outward, but somewhat angular on the subcostal vein. The middle of the wing is of a clear deep yellow, with no markings except the faint discal dot. The extradiscal dark line, which bounds the yellow portion of the wing, is oblique, slightly sinuous, and nearly parallel with the outer edge of the wing. Beyond this line the wing is dull pink, concolorous with the basal third of the wing. The fringe on both wings is dark pink, concolorous with the lines. Hind wings of the same clear deep yellow as the middle of the fore wings, with a distinct pink discal dot. The dark pink extradiscal line is slightly curved outward opposite the discal dot, and beyond this the wings are pink. Beneath much as above, but the lines are darker and rather

heavier, and the yellow portions are freckled with brown specks; discal dots distinct.

Length of body, ♂, 0.40; of fore wing, ♂, 0.55; expanse of wings, 1.15 inches.

Dallas, Tex. (Boll, Mus. Peab. Acad. Sc., Mus. Comp. Zool.).

This description is drawn up in part from Professor Zeller's type-specimen. It is one of the most delicate and beautiful species of the family, and, with its falcate fore wings, excavated hind wings, with their acute apex, the broad pink margins of the wings, and the deep yellow middle portion, need not be confounded with our other species of the family. •

ANAGOGA Hübner. Plate 5, fig. 17.

Anagoga Hübn. (in part), Verz., 294, 1818.

Azinophora Steph., Nomencl. Br. Ins., 44, 1829; "Cat., ii, 126, 1829?

Numeria Dup. (in part), Lep. France, viii, 107, 1829.

Anagoga Steph., Cat. Br. Lep., 177, 1850.

Numeria Lederer, Verh. Bot. Zool. Ges. Wien, 175, 1853.

Gen. (in part), Phal., ii, 131, 1857.

Body rather stout; abdomen of the male short and stout compared with those of *Selidosema* and *Lozogamma*. Front full and convex. Palpi large and long, though shorter, ascending and reaching by nearly the length of the head beyond the front; second joint very long; third short, conical, very small, depressed. Male antennae heavily pectinated nearly to the tip; in the female, simple. Fore wings with the costa arched rather more than usual; the apex acute, a little produced, but hardly subfalcate; outer edge bent more or less on the first median venule. Hind wings considerably produced toward the apex, which is rounded, of much the same shape as in *Selidosema*, the outer edge not being very full, while the inner angle is well marked. Its venation differs remarkably from that of *Lozogamma* and *Selidosema* in the presence of a short, broad, rhomboidal, subcostal areole, there being no areole in *Selidosema*, and the areole in *Lozogamma* being very long and narrow. The discal venules taken together follow a much curved line, much more regularly bent than in the allied genera named. Hind legs with the tibiae long and slender, not swollen; tarsi nearly as long as the tibiae.

Coloration usually ochreous-gray, dusted with ochreous-brown, with a single brown band, and tinged beneath with violet.

This genus has the front, palpi, antennae, venation, and hind legs of *Endropia*, but with the shape of the wings of *Selidosema* and *Lozogamma*,

particularly noticeable in those individuals in which the wings are not well angled. These characters are so fundamental that I remove the genus from the neighborhood of *Loxogramma* to that of *Endropia*. From this genus and *Antepione*, &c., it differs in the rounded hind wings, and their want of any well-marked angle or scallops. In form, they are not unlike *Heterolocha*. The venation is much as in *Antepione*, but the areole is much shorter, being regularly rhomboidal, while in *Endropia* there is no areole. *Anagoga* has therefore an interesting combination of the characters of *Selidosema*, *Antepione*, *Endropia*, and *Heterolocha*.

As regards the selection of a generic name, *Nameria* must be dropped for either Hübner's *Anagoga* (1818) or Stephen's *Azinophora* (1829); the former should evidently be retained.

ANAGOGA PULVERARIA Hübner. Plate 9, figs. 54, 55.

Phalana Gcometra pulveraria Linn., Syst. Nat., 10th ed., 521, 1758.

"*Gcometra pulveraria* Hübner, Schm. Eur., tab. 39, fig. 293."

Fidonia pulveraria Tietz., Schm. Eur., vi (ii), 309, 1827.

Dup., Lep. France, viii (iv), 471, plate 179, figs. 1, 2, 1829.

Azinophora pulveraria Steph., Nomencl. Br. Ins., 41, 1829; "Cat., ii, 126, 1829."

Nameria pulveraria H.-Sch., Schm. Eur., iii, 68, 1847.

Anagoga pulveraria Steph., Cat. Br. Lep., 177, 1859.

Nameria pulveraria Lederer, Verh. Bot. Zool. Ges. Wien, 175, 1853.

Guen., Phal., ii, 137, 1857.

Walk., List Lep. Het. Br. Mus., xxiii, 1016, 1861.

Nameria ociduararia Walk., List Lep. Het. Br. Mus., xxiii, 1016, 1861.

Eliopia plagifasciata Walk., List Lep. Het. Br. Mus., xxvi, 1598, 1862.

Eliopia californiararia Pack., Proc. Bost. Soc. Nat. Hist., xiii, 384, 1871.

3 ♂ and 2 ♀.—Pale rusty-ash, with a faint lilac tinge, with numerous brown scales and strigæ. In the middle of the fore wing, a dark-brown band, contrasting with the rest of the wing; inner side of the band moderately oblique, the edge being straight, not sinuate. On the outer side, the band is deeply hollowed out below the second median venule, the curve being very regular, and toward the costa the band retreats toward the middle of the wing, so that the band is just as wide on the costa as at the lower portion opposite the excavation. Below the costa, the band sends out three prolonged teeth on the last subcostal, and the first and second median venules respectively. Beyond, the wing is colored as near the base. Hind wings more densely speckled than fore wings, with a short, straight, brown line, starting from the inner edge near the inner angle, and fading away before reaching the middle of the wing; otherwise, the wing is unmarked. Beneath, no lines.

but the wing is ochreous, with a distinct yellowish tinge, and is densely speckled with brown, uniformly on both wings.

Length of body, ♂, 0.45–0.55, ♀, 0.45; of fore wing, ♂, 0.70–0.72, ♀, 0.60–0.70; expanse of wings, 0.95–1.35 inches.

Brunswick, Me., June 25 to July 10, not common (Packard); sides of Mount Washington, N. H., July (Morrison); Natick, Mass., June 29 (Stratton); Albany, N. Y. (Lintner); South Carolina (Sachs); Victoria, Vancouver's Island, July (Crotch, Mus. Comp. Zool.); Sanzalo, Cal. (Behrens).

This widely-distributed species may be known by the uniform rust-ash color, with the broad darker mesial band sending the three attenuated teeth along the venules, and by the irregular lilac band on the under side of the wing. It is liable to be confounded, from the thinness of the wings and the style of coloration, with the species of *Therina*.

I can find no differences between our specimens from New England, California, or Europe, that would even indicate climatic varieties. The Californian ones do not at all vary from New England examples. In the European, the band is a little narrower on the inner edge, the sinus being shallower; but, in the coloration, there is absolutely no difference. In size, the Europeans are larger than the Eastern American, and like the Californian, the latter slightly exceeding any of my European examples. Expanse of wings of the New England specimens, 0.95–1.26; European, 1.25–1.30; Vancouver's Island and Californian, 1.40 inches. These facts confirm what has been seen in other species, that European and Pacific-coast examples of the same species are usually larger than New England or Atlantic-coast specimens.

The only important variation observed is a variety figured on plate 9, fig. 55, from Natick, Mass. It is a male, and smaller than usual, with the wings opaque, the mesial band confused with the outer part of the wing, and narrower than usual, and there is a broad diffuse shade on the hind wings.

Larva—"Mr. Merryfield has described the general color of the caterpillar as purplish-brown, varied with ochreous; the head is bifid, light ochreous-brown, especially in front; a brown ochreous stripe, lightest at the upper edge, along the upper part of the side of the fifth segment. On each segment from the fifth (inclusive) backwards, is a pair of very small points, which are light in front and dark behind, besides smaller points just behind the spiracles. A pair of large warts on the back of the ninth segment, a pair much

smaller on the back of the tenth and twelfth, and a pair smaller on the back of the eleventh segment. The tenth, eleventh, and twelfth segments have some dark arrow-head lines (not however quite meeting in a point) on the back margined outwardly with ochreous; sides wrinkled, especially in the fore part of the body; belly purplish-brown, with ochreous blotches on each side, the claspers underneath being dark bluish-green, and the space between each pair of claspers yellowish; sometimes a lighter line down the middle of the belly. It feeds on sallow, spinning up among leaves and moss when full fed."—(Newman's British Moths, 90.)

Mr. L. W. Goodell writes me that he found the larva on the hazel-nut October 4, and that it measured, when fully grown, 0.90 inch in length, and was of a light-gray color, variegated obscurely with darker gray and a few black points. On the back of the eighth ring was a small hump; it became a pupa October 6, after spinning a thin cocoon within a folded leaf. The pupa is 0.40 inch long, is light brown, tinged with greenish on the thorax.

In the female from South Carolina, the body and wings are of a dark fawn-color, with the spots and band much deeper in tone than in the males, and beneath with a decided pink tinge.

The distribution of this moth in the Old World is thus given by Staudinger: Central and Northern Europe (excluding the polar regions); Piedmont; Bulgaria; Ural and Atlas Mountains; and Amur.

Of the other American species placed in this genus by M. Guenée, *N. obfirmaria* belongs to the *Ennomina*; *N. duaria* and *N. hamaria* are species of *Endropia*, as I observed by an examination of the type-specimen through the kindness of M. Guenée.

Desideratum.

Numeria fritillaria Guen.—"30^{mm}. Ailes supérieures à coude à peine senti; inférieures arrondies; les quatre d'un blanc-fuméux, aspergées d'une multitude stries d'un brun de bois, avec des traits terminaux noirs, et une ombre médiane commune large, fondue, indécise et traversée par une série de points noirs, suivis, aux supérieures, de petites places blanches, dont une plus large entre 2 et 3. Les mêmes ailes ont, en outre, les traces d'une ombre extrabasilaire. Dessous à peu près semblable à celui de *Capreolaria*."

I had thought this might be *Chora pulcherrima*, but it is evidently an *Anagoga*.

METROCAMPA Latreille. Plate 5, fig. 11.

"*Campara* Lam. (in part), An. sans Vert., iii, 163, 8, 1816."

Endalonia Hübn. (in part), Verz., 286, 1818.

Metrocampa Latr., Fam. Nat., 177, 1825.

Ellopiæ Treits. (in part), Schm. Eur., vi (v), 89, 1827.

Metrocampa Dup. (in part), Lep. France, vii (iv), 122, 1829.

Phalana Steph., Nomencl. Br. Ins., 43, 1829.

Campaa Steph., Ill., iii, 176, 1831.

Metrocampa Rorsd. (in part), Gen. Ind., 181, 1840.

Dup. (in part), Cat., 217, 1841.

H. Sch. (in part), Schm. Eur., iii, 39, 1847.

Endalonia Steph., Cat. Br. Lep., 168, 1850.

Metrocampa Lederer, Verh. Bot. Zool. Ges. Wien, 175, 1853.

Guen., Phal., i, 126, 1857.

Walk., List Lep. Het. Br. Mus., xx, 155, 1860.

Head with the front narrow, square. Labrum long, triangular. Mandibles long and slender. Palpi small and slender, narrow, ascending slightly; third joint minute, pointed, depressed, slightly surpassing the front. Antennæ well pectinated, simple in the female. Thorax moderately stout. Wings broad, fore wings with the costa convex; apex slightly bordered, slightly sub-falcate. Outer margin distinctly angulated in the middle, being very slightly excavated between the bend and the apex. Hind wings broad; internal angle subrectangular, even with the tip of the abdomen. Apex much rounded. Middle angle obtuse, a slight scallop between this and the apex. Venation: no subcostal cell; the first four subcostal venules are long; the independent vein is situated rather near the sixth subcostal; the posterior discal vein is very oblique, but not curved as in *Ellopiæ*. Legs long, slender; hind tibiae hardly thickened, very long. Spurs slender; hind tarsi but little more than half as long as the tibiae. Abdomen long, very slender. Anal tuft rather long. Coloration: pearly-white, with a greenish tinge; an inner and outer straight oblique line margined without with white.

This genus, besides being easily identifiable by the pearly-white color of the species, differs a good deal from *Therina*, to which it is nearly allied in the venation; while the antennæ are scarcely plumose, though the shape of the wings is nearly the same in the two genera.

Larva.—"Caterpillars elongated, convex above, much flattened below, with lateral filamentous appendages as in *Catocala*; having three pairs of abdominal feet, of which the first are slenderer and shorter than the second; head flattened in front; living on trees. Chrysalides at the surface of the earth."—Guenée.

Newman states that the caterpillar of *M. margaritata* "is of a dull olive-

green colour, with a darker line down the middle of the back, margined on both sides with a series of whitish marks". It feeds on the broom, elm, hornbeam, birch, and oak. It is found in September and again in May, living through the winter.

METROCAMPA PERLARIA Guenée. (Plate 12, fig. 1.)

Metrocampa perlata Guen., Phal., i, 128, 1857.

Walk., Last Lep. Het. Br. Mus., xv, 157, 1860.

Metrocampa virato-perlata Pack., Proc. Bost. Soc. Nat. Hist., xvi, 38, 1874.

5 ♂ and 7 ♀.—Pearly-white, with a decided greenish tinge. Body, antennae, and feet snow-white. Front white; a transverse reddish line just below the antennae, but never extending below on to the front. Fore wings crossed by two broad, diffuse, white lines, bordered widely within with pale brown, which fades into the ground-color of the wing; both lines are straight. Fringe white. Beneath white; the lines not reproduced beneath.

It is, contrary to Guenée's statement, as large as the European *margaritacea*, but may perhaps often be smaller; but the angle of the hind wings is no more marked than in the European, but, as he says, the outer line terminates nearer the apex, and this is the best character to separate our two American species from the European, while the front of the European is redder, the front edge of the front being white, and the wings uniformly greener.

Length of body, ♂, 0.50–0.60, ♀, 0.50; of fore wing, ♂, 0.75–0.85, ♀, 0.90–1.00; expanse of wings, 1.45–2.00 inches.

Montreal, Canada (Lyman); Brunswick, Me. (Packard); Portland, Me. (Morse); White Mountains, N. H., July 20–30 (Scudder); New York (Grote); West Farms, N. Y. (Angus); Philadelphia, Pa. (Ent. Soc.).

This species, at once recognized by its pearly-white color and greenish tinge, differs only from the European *margaritaria* in the extradiscal line being bent at right angles on the costa, while in the European species there is only a slight curve.

Although I originally regarded two Californian examples as distinct from the eastern *perlata*, on further comparison with more material (2 ♂ and 5 ♀) from Vancouver Island, I can see no differences of importance. The western ones are a little larger than the eastern.

Length of wing of Vancouver's Island specimens, ♂, 0.85, ♀, 1.00; of a ♂ from New York, 0.75; of a ♀ from White Mountains, N. H., 0.90, and one from Philadelphia, Pa., 0.95 inch.

THERINA Hübner. Plate 6, fig. 1.

- Therina* Hübner, Verz., 283, 1818.
Ellopiia Treits., (in part), Schum. Eur., vi (i), 89, 1827.
Metrocampa Dup. (in part), Lep. France, vii (ix), 122, 1829.
Ellopiia Steph., Nomencl. Br. Ins., 43, 1829.
 Steph., Ill., iii, 177, 1831.
Metrocampa Boisd. (in part), Gen. Ind., 181, 1840.
 Dup. (in part), Cat., 217, 1844.
 H.-Sch. (in part), Schum. Eur., iii, 39, 1847.
Ellopiia Steph., Cat. Br. Lep., 168, 1850.
 Lederer, Verh. Bot. Zool. Ges. Wien, 175, 1853.
 Guen., Phal., i, 129, 1857.
 Walk., List Lep. Het. Br. Mus., xx, 158, 1860.

Scales of the vertex rather long; those of the front short and closely appressed. Mandibles and labrum long, the bases much exerted beyond the front. Palpi very slender, acute, slightly ascending; the third joint, which is as broad as the second joint, surpasses the front: the first and second very narrow. Antennæ with very long pectinations; in the female, simple. Thorax slender. Wings thin and broad. Fore wings with the costa convex, especially on the apex. Outer margin bent on the second median venule, hardly angulated, somewhat excavated between the bend and the apex; in the female, more excavated and angulated. Hind wings with the internal angle rectangular, passing a little beyond the tip of the abdomen. Apex much rounded. Middle angle obtuse, more acute in the female than in the male. Venation: costal region very wide; two subcostal cells, the inner lozenge-shaped, long and narrow, the outer irregularly oblong; the posterior discal venule partly obsolete, much curved on the obsolete portion. Legs very slender; hind tibiæ not thickened. Spurs slender; terminal pair one-third as long as the first pair. Tarsi two-thirds as long as the tibiæ. Male abdomen very slender, with a slight tuft; female slender, very obtuse. Coloration: pale ochreous, very thinly scaled, semi-transparent. An inner and outer line, the outer straight, or angulated inward below the costa and on the fourth median venule.

While very similar to *Metrocampa* in the form of the wings, the antennæ are more plumose, and there are two subcostal cells, where there is none in *Metrocampa*. The wings of the male are more angular than in the female in this genus and in *Metrocampa*, while the reverse is the case in *Sicya*, *Heterocha*, and *Opisthograptis*.

Larva.—Caterpillars cylindrical, without ventral fringes, having ten complete feet, and besides an eleventh shorter, or rudimentary pair; body

sometimes smooth, sometimes ornamented with small trapezoidal tubercles, but without any other eminence; head flattened; living on trees."—Guenée.

Synopsis of the Species.

A. Wings well bent, with a distinct angle on the hinder pair:

- Subochreous, with dark lines edged with ochreous *E. p. rubra*.
Whitish-ochreous, with two parallel straight lines *E. androparia*.

B. Wings slightly bent: hind wings rounded:

- Dusky; hyaline; veins dark *E. semicircularis*.

THEIRIA FERRIDARIA Hübner. Plate 12, figs. 2, 3; larva, plate 13, fig. 34;
pupa, fig. 34*a*.

Theiria ferridaria Hübner, Geyer's Zutr., 8, figs. 499, 500, 1825.

Ellopia ferridaria Guen., Phal., i, 132, 1857.

Ellopia fiscellaria Guen., Phal., i, 133, 1857.

Ellopia flagitiaria Guen., Phal., i, 133, 1857.

Ellopia ferridaria Walk., List Lep. Het. Br. Mus., xx, 161, 1860.

Ellopia fiscellaria Walk., List Lep. Het. Br. Mus., xx, 161, 1860.

Ellopia scitata Walk., List Lep. Het. Br. Mus., xxvi, 1510, 1862.

12 ♂ and 2 ♀.—Pale ochreous, more so than usual; head and front of the thorax and antennæ deep ochreous. Wings densely speckled with smoky spots (though varying in degree of irroration). Wings well angulated, the angle on the fore wings often acute, on the hind wings forming a slight tail. Outer line dark brown, bordered externally with ochreous. Inner line situated either on or a little within the inner third of the wing, a little curved. Discal dot dark, distinct, sometimes wanting on the hind wings. Outer line sinuate, or zigzag, varying greatly, the angle on the first median venule being slight or very marked on both wings. On the hind wings, a single line only. Beneath, much paler; the lines re-appear, but are diffuse and smoky. Legs: tibiæ and tarsi of the two pairs of fore legs brown; hind legs pale ochreous.

Length of body, ♂, 0.60; of fore wing, ♂, 0.65–0.85, ♀, 0.73; expanse of wings, 1.50 inches.

Montreal, Canada (Lyman); Dublin, N. H. (Leonard, Harris Coll.); Massachusetts (Sanborn and Harris Coll.); Amherst (Packard); Maine, common in hard woods late in September and early in October (Packard and Morse); Salem, Mass., October 2 (Cassino); New York (Anger and Grote); Albany, N. Y. (Lintner and Meske); Philadelphia, Pa. (Ent. Soc.); Victoria, Vancouver's Island, July (Edwards and Crotch, Mus. Comp. Zool.).

In one male received from the American Entomological Society, while the wings are well angulated, the outer line is much straighter than usual, being but slightly sinuate, as is the line on the hind wings; but otherwise it does not differ.

This is our most common species, and is at once known by the much speckled wings and ochreous-bordered, blackish lines. It varies greatly in the distance apart of the two lines, which, in the fore wing, are in some twice as wide apart as in others.

This species is so variable that I have been able to find varieties corresponding to Hübner's *ferriidaria* and Guenée's *fiscellaria*. About Guenée's *flagitiaria* I do not feel so sure; but while it is a distinct variety, I find forms of *ferriidaria* which correspond to it, the lines being dark. Walker's specimens in the British Museum labeled *E. ferriidaria*, *fiscellaria*, and *flagitiaria*, are different forms of the same species.

Hübner's figures of *T. ferriidaria* differ from the normal form of the species, namely, *T. fiscellaria*, in the male wings being scarcely angulated, in the outer line on the fore wings being bent backward and inward on the costa, as no other species has it, and he does not represent the lines as showing through on the under side, as those in *fiscellaria* do decidedly. Plate 12, fig. 2, represents the ordinary form (= Guenée's *fiscellaria*), and fig. 3 the variety with simply sinuous lines, which is Hübner's *ferriidaria*.

The five males and one female from Vancouver's Island are larger, but do not differ so much from eastern examples as the latter among themselves. They are more yellow, with coarser dark speckles, and the lines are more broadly shaded with yellow. The length of one fore wing is 0.85, while that of a large eastern example is 0.73 inch. Certain eastern examples from Salem are colored much as in the Vancouver's Island ones. The examples from Salem are deeply suffused with dark beyond the extradiscal line, the shade extending half-way to the edge of the wing, while the inner line is very diffuse.

Larva.—Body cylindrical, smooth; head of the same width as the body. Body yellowish-green above, pale purplish below. Two fine, blackish, lateral lines, with a pale line above. Pupa rather slender, whitish, slashed and spotted with brown. Food-plant, *Halasia diptera*.—(Described from Abbot's MS. drawing.)

THERINA ENDIOPHARIA Packard. Plate 12, fig. 6.

Ellopia pultaria Walk., List Lep. Het. Br. Mus., i, 160, 1860.*Ellopia endiopharia* Grote and Rob., Ann. Ent. Nat. N. Y., viii, plate 15A, fig. 8, 1867.

♂ and ♀.—Head and thorax, including the antennae and legs, pale ochreous, extending to the costa of the fore wings, especially the inner side. Wings pale whitish, with a slight ochreous tint, with indistinct cinereous speckles, especially marked toward the outer edge; fringe concolorous with the rest of the wings; two parallel lines, the inner a perfectly straight, pale-brown hair-line, situated just before the forking of the median vein, and the outer, narrow, cinereous, slightly oblique, but not curved; on the secondaries, which are concolorous with the fore wings, is a single line, very slightly curved in the middle; no discal dot on either wing; outer edge angulated distinctly; the tail on the hind wings well developed, but a little less so than in *E. flagitaria*, and the wings are broader and shorter, while the anterior pair are not produced so much at the apex. Beneath, the costa is ochreous, but the rest of the wing is whitish-ochreous; the wings are very transparent, so that the lines distinctly appear through.

Length of body, ♂, 0.55; of fore wing, ♂, 0.70, ♀, 0.75; expanse of wings, 1.50 inches.

Montreal, Canada (Caulfield); Massachusetts (Sanborn); Brooklyn, N. Y. (Graef); New York (Grote); Philadelphia (Grote).

The ochreous head and thorax, including the antennae, in distinction from the pale transparent wings, the pale-brown, parallel lines, the inner perfectly straight and the outer one slightly curved, will separate this species from its allies. The under side is less strigated than the upper. One male specimen differs in the outer line being a little curved, and much nearer the outer edge of the wing than usual.

It does not seem to be identical with *Ellopia pultaria* of Guenée, for he describes it as having the hind wings almost completely rounded, while in our specimens they are as much bent as in *Th. ferridaria*. Walker's *pultaria* is this species, according to Mr. Grote (Trans. Amer. Ent. Soc., 1868).

THERINA SEMINUDARIA Packard. Plate 12, figs. 4, 5.

Ellopia seminudaria Walk., List Lep. Het. Br. Mus., xx, 161, 1860.*Ellopia seminudata* Walk., List Lep. Het. Br. Mus., xxv, 1508, 1862.*Ellopia sicurea* Walk., List Lep. Het. Br. Mus., xxxv, Suppl. v, 1647, 1866.*Ellopia bibularia* Grote and Rob., Ann. Ent. Hist. N. Y., viii, plate 15A, fig. 8, 1867.*Ellopia pellucidaria* Grote and Rob., Ann. Ent. Hist. N. Y., viii, plate 15A, fig. 9, 1867.

3 ♂ and 3 ♀.—Smoky hyaline ash color, often whitish; head ochreous,

Palpi rather stout, ascending, passing a little beyond the front: third joint rather long, conical. Antennæ ochreous, ashen above, with long, delicate, fine, close-set, black pectinations. Body pale cinereous, with an almost imperceptible ochreous tinge. Fore wings with a basal, slightly-curved, dark, diffuse line, which is especially marked on the veins: discal dot distinct, but diffuse, rather larger than in *T. fiscellaria*; an outer, not very oblique, slightly sinuate, dusky line, sometimes angulated on the first median venule in both wings: it is thickened on the venules, curving inward a little toward the base; the wings are rather thickly flaked with smoky strigæ, especially on the costa and outer edge. Hind wings without any discal dot; the single line a little curved, not reaching to the costa; wings very transparent at the base. Beneath, whitish, very transparent; the lines faintly appear; no discal dot: costa tinged slightly with ochreous. Hind wings scarcely angulated, the angle being almost obsolete.

Length of body, ♂, 0.50; of fore wing, ♂, 0.70–0.73, ♀, 0.75; expanse of wings, 1.50 inches.

Montreal, Canada (Caulfield); Massachusetts (Sanborn); Eastham, Mass. (W. C. Fish); Cape Cod, Mass., June 16 (Prof. Agassiz, Mus. Comp. Zool.); New York (Grote); near Mammoth Cave, Ky., April 26 (Sanborn, Geol. Surv. Ky.).

This is a very variable species, in rubbed examples being unusually pale transparent ashen, but dusky in fresh specimens. The lines are arranged much as in *E. fiscellaria*, but where the wings are slightly rubbed they are represented by a series of punctures on the venules. The unusually long, filiform, closely-set pectinations of the antennæ, and the granite-gray wings, with dusky lines, not tinged with ochreous, will distinguish it from the other species. It varies greatly, the lines in one female being twice as far apart as in another, and the outer line in some being almost straight, in others a little bent. If I had had Mr. Grote's types alone of male *E. bibularia* and female *pellucidaria*, I should have regarded them as distinct; but, with the addition of other specimens of both sexes, I have felt compelled to unite them, as the species seems to be as variable as in *T. fiscellaria*. One Kentucky female expands only 1.20 inches. It is represented on plate 12, fig. 5; but the artist has not represented the inner line on the fore wings.

Desiderata.

Ellapia pallaria Guen., Phal., i, 132, ♀.—“40^{mm}. Ailes d'un jaune-paille

sale, avec les lignes peu marquées, impactées de jaune lavie et de gris pâle: supérieures avec l'angle de la 2. peu sensible et le bord droit jusqu'à l'apex, les deux lignes écartées presque parallèles, la coudée ou du moins le sommet et sans angle sensible. Ailes inférieures presque complètement arrondies, avec la ligne presque droite ou du moins à peine arquée et sans angle sensible. Ailes inférieures presque complètement arrondies, avec la ligne presque droite ou du moins à peine arquée et sans coudée. Dessous tout uni, sans aucun dessin ni nuance. Tête et collier d'un jaune-ochracé.

"Amér. Septentrionale en mai dans les prairies et les bois de chêne. Une ♀. Coll. Gn.

"Chenille d'un gris-jaunâtre sur le dos, d'un gris-violetâtre sous le ventre et sur les côtés: ces deux nuances traversées par des lignes noires et séparées par une bandelette latérale blanche. Tête et pattes concolores. Elle vit en avril sur les chênes. La chrysalide est d'un blanc-testacé, avec l'enveloppe des ailes marquée de traits noirs dans le sens des nervures et quatre traînées longitudinales d'atomes noirâtres."

Ellopiat! placcaria Guen., Phal., i, 132, 1857.—"36^{mm}. Ailes supérieures ayant un coude très-marqué et très-anguleux au bout de la 2. d'un ochracé pâle, fortement strié verticalement de gris, avec les deux lignes assez rapprochées: la première coudée sur la costale, la seconde formant un coude arrondi dans la cellule, puis parallèles jusqu'au bas et laissant entre elles un espace plus foncé que le fond. Inférieures plus claires et un peu rougeâtres, unies et avec les traces d'une ligne en dessus, très-striées et avec cette ligne très-distincte et coudée dans la cellule en dessous. Ces ailes ayant un petit angle ou dent peu saillante au bout de la 2. Palpes plus longs et plus hérissés que chez les autres *Ellopiat* et dépassant notablement la tête. Californie. Un ♂. Coll. Gn. Elle diffère un peu des autres *Ellopiat* et n'appartient peut-être pas à ce genre."

Ellopiat panisaria Walk., List, xx, 163. One of the specimens in the British Museum is a true *E. pallaria* Walk., and the other is *Endropia latitarsaria* Walk.!!! [*Numeria duarria* Guen.!!!].

Ellopiat! amyrisaria Walk., List, xx, 164, is a *Cabera*, and too much rubbed for identification or description.

Ellopiat myndaria Walk., List, xx, 164, from Mexico, is a *Cabera*.

Ellopiat anisaria Walk., List, xxvi, 4507, is evidently *Euticha rebaria*.

Ellopia plagifasciata Walk., List, xxvi, 1508, is evidently *Anagoga pulveraria*.

Ellopia basilaria Walk., List, xxvi, 1508, is *Gueneria basiatata*!

Ellopia subpricata Walk., List, xxvi, 1509. This is a much-rubbed *Epione sinuaria*, as labeled by Walker.

Ellopia incoloraria Walk., List, xxvi, 1509. This species is *Gueneria basiatata*!

Ellopia deplanaria Walk., List, xxvi, 1510. This is an *Endropia*; probably *E. amarnaria* or near it.

Ellopia scitata Walk., List, xxvi, 1510. This is not a *Therina*.

EPIRRANTHIS Hübner.

Epirranthis Hübn., Schm. Exot., ii, 1806; (in part), Verz., 296, 1818.

Numeria Guen. (in part), Phal., ii, 134, 1857.

Walk. (in part), List Lep. Het. Br. Mus., xxiii, 1015, 1861.

Body very stout and thick, the thorax hairy, and the abdomen rather short. Head broad, squarish in front. Palpi broad and stout, ascending a little, extending well in front; third joint long and slender. Male antennae heavily pectinated to the end; simple in the female. Wings short and broad; anterior pair not subfalcate; costa more convex than in *Endropia*; apex pointed, subrectangular; outer edge full, convex, with a slight bend in the middle, scarcely more distinct in the female than in the male. Hind wings full, with a slight bend in the middle, extending slightly beyond the end of the abdomen. Venation: much as in the lower species of *Endropia* (*E. hypochraria*), the costal vein free; the first and second subcostal venules very long, equal in length; the fifth subcostal arises nearer the origin of the sixth than in *Endropia*. Discal venules much as in *Endropia*. Hind legs with the tibiae not swollen; the tarsi rather long and thick, much as in *Endropia*. Coloration: deep reddish-brown; hind wings and under surface of both wings bathed with bright ochreous.

The single species of this genus is quite unlike *Numeria*, and is closely allied in all its structural features with the lower, simpler species of *Endropia*, from which it differs in the slight characters indicated above, chiefly in the more convex costa, the more acute palpi, and the shorter wings, as well as the quite different style of coloration.

EPIRRANTIS OBTIRMARIA Hübner. Plate 12, fig. 7.

Eperrhantia obtirmaria Hübner, Schin. Exot., ii, 1896.*Nannaria obtirmaria* Guen., Phal., ii, 135, 1857.

Walk., List Lep. Het. Br. Mus., xxii, 1045, 1861.

Antennae brown. Body and wings dull reddish-brown; hind wings at base and both wings beneath reddish ochreous. Head and thorax brown; abdomen becoming ochreous at the tip. Fore wings uniformly dull rust-red brown, except a broad, mesial, dull, ochreous shade, which is slightly oblique but straight on the outer side and regularly curved within, and a third or a half wider on the costa than the inner edge; this shade speckled with brown and brown on the costa. Hind wings deep ochreous at base; just beyond the large, distinct, discal dot, several times larger than on the fore wings, is a single, dark-brown, sinuate line, beyond which the wing is brown, but toward the apex dull ochreous. Fringe brown. Beneath, deep reddish-ochreous, densely and coarsely speckled, with a common dull-brown line, diffuse and dilated in the middle on the hind wings. The female is much larger, the mesial shade much fainter, being nearly as brown as the rest of the wing, while the two lines bounding it are clearer, being brown, edged narrowly with deep ochreous. More coarsely speckled beneath than in the male.

Length of body, ♂, 0.50, ♀, 0.45; of fore wing, ♂, 0.67, ♀, 0.65–0.75; expanse of wings, 1.30–1.60 inches.

Maine, June, frequent in pine-woods (Packard); Massachusetts (Sanborn); Albany, N. Y. (Lintner, "May 21", and Meske); Philadelphia, Pa. (Ent. Soc. and Grote).

ENDROPIA Guenée. Plate 6, figs. 6, 10, 13, 14. ★

Enaomus Treits., (in part), Schin. Eur., vi (i), 3, 1827.

Boisd., (in part), Gen. Ind., 182, 1840.

Epione, (in part) and *Metrocamptus*, (in part), H.-Sch., Exot. Schin., 1850–55.*Prionoxyla* Guen., Phal., i, 90, 1857.*Endropia* Guen., Phal., i, 122, 1857.

Walk., List Lep. Het. Br. Mus., xx, 118, 1860.

Head nearly square in front, being rather narrow. Palpi rather large, either porrect or slightly ascending, and reaching farther than usual beyond the front; the three joints very distinct, the third two-thirds as long as the second is broad. Male antennae heavily pectinated; in the female, simple. Thorax thick and hairy. Fore wings moderately broad and usually bilcate; the costal edge either straight or a little curved; outer edge either bent once,

or angular and slightly or deeply serrate. Hind wings extending as far as the tip of the abdomen, full and large, either scarcely bent, and with a slight sinus, or distinctly angulated, with a single deep sinus, or regularly and deeply dentate. Venation: costal vein either free (*hypochraria*) or anastomosing with the subcostal (*bilincaria* and *serrataria*). No subcostal cell, or else a cell is nearly completed by the close approximation of the second subcostal venule to the main vein. In *hypochraria*, the first and second subcostal venules of the same length; in the other species, the second is very long. The posterior discal venule is more or less oblique. Hind legs with the tibiae much swollen; the tarsi from three-fourths to one-half as long as the tibiae. Abdomen rather long and slender, well tufted. Coloration: different shades of ochreous-brown, with the extradiscal line common to both wings, and often split asunder in the middle of the wing, inclosing a lanceolate oval area: usually with a white or dark oblique apical spot or streak.

The species of this large and variable genus may usually be distinguished by the falcate and often deeply serrate wings, the large palpi, and the thick, swollen, hind tibiae. Where the wings are not serrated, they have a large angle in the middle of the outer edge, often preceded by a deep sinus. The females have more deeply serrate and broader wings than the males.

Synopsis of the Species.

A. Wings short, not falcate, entire; body hairy:

Ash-reddish-brown above; common extradiscal line sinuous; beneath reddish-ochreous *E. pilosaria*.

B. Wings subfalcate; hind wings sinuous, but not notched:

Paler ash than usual; common extradiscal line nearly straight; beneath washed with ochreous *E. apiciaria*.

Rust brown; extradiscal line reddish, very sinuous, but not angular *E. duaria*.

Ash brown, with a violet tinge; extradiscal line bent at right angles *E. hypochraria*.

C. Fore wings more falcate than before; hind wings notched near the apex:

A large species, pale ash-brown; a submarginal row of light irregular spots; outer half of both wings darker than the inner *E. marginata*.

Uniform fawn-brown, with reddish lines and fringe; no teeth near the apex of the hind wings; extradiscal lines straight; an apical light patch *E. rivulenta*.

Hind wings tufted; not dentate or sinuous as usual, reddish-brown and subochreous; mottled irregularly; extradiscal line sinuous *E. testinaria*.

In form like *rivulenta*, but toothed near the apex; wings whitish within, fawn-brown on the outer two-thirds; a subapical light patch *E. madusaria*.

Deep ochreous; margin of the wings reddish-brown; hind wings with a deep angular notch; a subapical light patch, with an oblique row of smaller spots... *E. amatoria*.

D. Wings deeply serrate, but the species rather small:

A small species; wings deeply serrate; a heavy, common, extradiscal band *E. armataria*,
 Like *armataria*, but larger; clear fawn reddish brown, with narrow brown lines *E. fulvicaria*.

E. Fore wings falcate; hind wings in part or wholly serrate:

Pale ochreous, with brown lines; extradiscal line double in σ , straight and single
 in τ ; three subapical teeth in the hind wings *E. pectinaria*.

Like *pectinaria*, but with larger teeth; the wings more serrated than in any other
 species; dark ash ochreous-brown, with the extradiscal line wavy; the outer
 half of the wings darker than the inner *E. epheburia*.

Much like *serrataria*; the wings as much notched, but the wings are ochreous
 pearl-brown, not yellow, and the dark portions contrast less with the paler
 than in *serrataria* *E. obtusaria*.

Bright yellow, with a heavy inner line common to both wings; the extradiscal
 line continuous with the dark-brown border of the wings, which are serrated
 deeply *E. serrataria*.

ENDROPIA PILOSARIA, *sp. nov.* Plate 12, fig. 8.

1 σ .—Body stout; antennae well pectinated; thorax very stout, unusually
 pilose; head stout; palpi large, porrect, extending far beyond the head;
 wings short and broad; edges entire; fore wings square at tip, not falcate;
 head and prothorax ferruginous; antennae pale cinereous; pectinations darker;
 wings uniformly brown, with minute ferruginous scales and a very indistinct
 olivaceous tinge; much paler cinereous beyond the outer line; an inner,
 curved, diffuse, very indistinct line; no discal dot; base of the costa ferru-
 ginous; uniformly brown from the base of the wing to the outer line, which
 is nearly straight compared with the other species; it is bent slightly just
 below the middle of the wing, thence going straight to the costa; it is lined
 with black scales, and edged externally with a white band. The wing beyond
 is much paler gray, with black scales, and a slight, almost imperceptible, oliva-
 ceous tinge; edge entire, rectangular at tip; fringe concolorous with the
 margin. Hind wings concolorous with the fore wings; discal dot black, dis-
 tinct. Beneath, unusually bright rust-red; discal dot small, but distinct;
 the common line pale gray, broad and diffuse on the outer edge, within lim-
 ited by black scales; fringe dull, a little darker than the rest of the wing;
 inner edge of fringe pale gray.

Length of the body, σ , 0.52; of fore wing, σ , 0.60; expanse of wings,
 1.20 inches.

This species may be recognized by the stout, thick, woolly thorax, with
 short broad wings and rectangular tips, while the outer edge is entire, and the
 wings beneath are brighter than usual, by the pale margin above, and the
 uniform darker basal two-thirds of the wing, the outer line being nearly

straight, besides being the smallest species known. It might be at first sight separated from *Endropia*, but the aberrant characters are too slight, though it forms a distinct section of the genus.

ENDROPIA APICIARIA, *sp. nov.* Plate 12, fig. 9.

2 ♂ and 2 ♀.—The wings of this species are more angular and the hind wings more dentate than in *E. duaria*, but less so than in *E. hypochraria*. On the hind wings, the sinus is deep but simple, not having the small tooth present in *hypochraria*. The general color is whitish-ash, much lighter than in the allied species. Head and antennæ reddish. Wings whitish-ash, with reddish-brown scales on the costa near the head. Fore wings with two dark-brown lines, the inner bent and curved as in *hypochraria*, while the outer line is straight in the male, not sinuous, being still straighter than in *pilosaria*. In the female, the line is flexuous on both wings. Accompanying and beyond the line is a broken, broad, diffuse band, often obsolete, in one male entirely so. An obsolete, dark, apical line (absent in one male). Distinct black discal dots on both wings. Hind wings with a single dark line, fading out toward the discal dot. Beneath, the common line is more conspicuous than above, washed with orange, as is the under side of the wings generally, while just beyond the line on the outer third of the wing is a leaden patch. The discal dots are smaller than above.

Length of body, ♂, 0.65, ♀, 0.65; of fore wing, ♂, 0.75, ♀, 0.68; expanse of wings, 1.10 inches.

Brunswick, Me., June and July, in company with *hypochraria*; Salem, Mass., June 23 (Packard); Hyde Park, near Boston, Mass., June 15 (Morrison); Albany, N. Y., June 7 (Meske).

This species need not be confounded with any other, as the outer line common to both wings is straight in the male and slightly sinuous in the female, much less so than in *E. duaria*. It is also whitish-ash, and washed with orange beneath more than in the other species.

ENDROPIA DUARIA Packard. Plate 12, fig. 10.

Nameria duaria Guen.!!!, Phal., i, 135, 1857.

Nameria hamaria Guen.!!!, Phal., i, 136, 1857.

Endropia lateritaria Walk.!!! (not Guen.), List Lep. Hel. Br. Mus., xx, 151, 1860.

Endropia homitaria Grote and Rob., Trans. Amer. Ent. Soc., ii, 80, 1868.

1 ♂ and 3 ♀.—Head large; front ferruginous between the antennæ, the palpi very large and stout, porrect, extending far beyond the head; anten-

are well pectinated. Body and wings ashen-ferruginous (sometimes deep rust-brown). Wings speckled with black; an inner curved dark line with two lobes on the median space, edged externally with ferruginous. Discal dot distinct; outer line oblique, scarcely angulated, sometimes waved, dentate (especially in the middle of the wing), shaded broadly within and quite regularly with rust-red. In one female, the space between the two lines is deeper brown than elsewhere. On the outer side, on the second median cell, is a round black spot. An apical, rather long, black line, terminating directly on the apex; above a little paler ashen. Outer edge of the wing below clear; fringe very slightly darker. Hind wings colored much as the fore wings, paler toward the base, darker beyond the line, which is more distinct on the hind edge. Beneath, more uniformly ferruginous, especially on the outer third of the wing. The common line reappears, broad, indistinct, subviolaceous. Body and legs more ferruginous beneath than above. In rubbed specimens, the lines are interrupted.

Length of body, ♂, 0.55–0.62; of fore wing, ♂, 0.65–0.76; expanse of wings, 1.50–1.60 inches.

Montreal, Canada (Caulfield); Brunswick, Me., June, common (Packard); Boston and vicinity (Morse, Sanborn, Smith, Shurtleff, May 28); Albany, N. Y., June 4 (Lintner and Meske); Phila. Ent. Soc.; Racine, Wis. (Hoy, Riley Coll.); West Virginia (Lintner).

This form differs from *E. hypochraria* in its simple hind wings which have but a single slight excavation below the apex, and in the outer line being oblique, sinuate, and not rectangular. From *E. apiciaria* it differs in the apex being rectangular; the lines are waved, edged within with ferruginous. The single dark spot on the middle, just outside the outer line, will separate it also. Beneath, it is darker and more reddish than in any of the other species.

Like the other species mentioned above, this species belongs to the second and lowest section of the genus, having the apex rectangular. When faded, the reddish scales disappear as in *hypochraria*, and it has a pale-ash hue. In some individuals, there are two diffuse, indistinct, broad, plumbeous lines on the fore wings. Head and prothorax and costa of wings at base rufous; wings usually much brighter rufous than usual, and without any apical oblique streaks; an unusually broad, diffuse, very indistinct, basal line, but slightly curved, with leaden-colored scales; between the basal and the outer line, the wing is clear rufous; no discal dots; the outer, broad, diffuse

line is broadly angulated on the middle of the wing. Fringe concolorous with the lines. Hind wings concolorous with the fore wings, paler toward the base. Discal dots rather large, distinct. Beneath, the wing is ochreous, thickly sprinkled with dull violet or tawny strigæ; a common, diffuse, broad line, especially on the hind wings. Antennæ gray; branches reddish.

Length of body, 0.58; of fore wing, 0.64 inch.

The bright ferruginous lines, and leaden, subviolaceous, diffuse lines, the inner of which is slightly curved, and the outer nearly rectangular at the middle of the wing, the want of the usual apical streak, and the sinuate line on the hind wings, with its small size, slender body, and entire wings, readily separate it from any other species, though its nearest ally is *E. hypochraria*. Of my three males, no two are alike. One male, from West Virginia (Lintner), is dull tawny-brown, densely speckled with two broad plumbeous shades on the fore wings and one on the hind wings; beneath, the shades are very distinct, and the wings are dull ochreous; veins dull ochreous; head and front of thorax dull ochreous.

ENDROPIA HYPOCHRARIA Herrich-Schaeffer Plate 12, fig. 12.

Epion (*Endropia*) *hypochraria* H.-Sch., Ausserer, Schum., 63, figs. 207, 208, 1850-58.

Endropia hypochraria!!! Guen., Phal., i, 125, 1857.

Endropia refractaria Guen., Phal., i, 125, 1857.

Endropia lateritaria Guen., Phal., i, 125, 1857.

Endropia hypochraria Walk., List Lep. Het. Br. Mus., xx, 150, 1860.

Endropia refractaria Walk., List Lep. Het. Br. Mus., xx, 151, 1860.

Endropia mestsata Walk., List Lep. Het. Br. Mus., xx, 154, 1860.

20 ♂ and 14 ♀.—Palpi very long and slender at the tip. Wings very short and broad, not toothed, except having a sinus between the apex and the middle angle of the hind wings, being much more entire than in any of the preceding species. The female is much more falcate and angulated than the male. Body and wings pale brown or ashen, mottled with dark; wings with ferruginous mottlings, and often a distinct violet hue along the lines and on the fringe; the tip of the abdomen projects but a little beyond the hind wings. Fore wings with a basal line much curved in front of the median vein; behind it sinuate, shaded beyond with rusty-brown, with sometimes a faint olivaceous tinge, and with a violet hue along the inside; outer line nearly straight in its general course, angulated on the first median vein, the angle very large and going straight from the apex to the costa, shaded broadly within with brown, externally with a faint violet tinge; this line is

common to both wings, and is broadly angulated on the hind wings, just beyond, nearer the line than the edge of the wing, is a faint brownish shade, consisting at times of long lunules interrupted by the veins; this shade is common to both wings (and is sometimes obsolete); discal dots rather large, dark brown; fringe rather pale where the outer border is pale, and with a violet line or darker brown, and checkered opposite the termination of the venules. Hind wings like the fore wings, except that the inner line is wanting; beneath, distinctly ochreous, with dense reddish strigæ; outer common line very distinct, shaded externally with dull violet mingled with whitish; fringe dull violet, checkered with darker; discal dots distinct reddish, whitish on the inner edge of both wings; often the strigæ are tawny, and the fringe is whitish, and the violet fringe wanting, while the degree of mottling varies, being occasionally very dense, giving a tawny appearance to the under side; the inner line is sometimes wanting; in one case, the brown shading along the common line has a faint greenish tint.

It may be at once known by the broad, large angle of the outer line, and its violet hue, the yellowish under side, and its small size. In a female from Kansas, the under side is bright ochreous-yellow.

Length of body, ♂, 0.50-0.60, ♀, 0.60; of fore wing, ♂, 0.60-0.70, ♀, 0.80; expanse of wings, 1.60 inches.

Montreal, Canada (Lyman); Maine, June (Packard); Massachusetts, July (Sanborn, Stratton); New York, July 8 (Meske and Lintner); Philadelphia, Pa., June (Grote and Ent. Soc.); West Farms, N. Y. (Angus); Missouri (Riley); Lawrence, Kans. (Snow).

Guenée's type of *E. refractaria* is a single rubbed *hypochraria*; his *lateritaria* seems, by the description, to be *hypochraria*. Walker's *refractaria* is a much rubbed *hypochraria*.

ENDROPIA MARGINATA Packard. Plate 12, fig. 13.

Cabeodius marginata Mniszch, Proc. Bost. Soc. Nat. Hist., xi, 169, 1899.

4 ♂ and 2 ♀ — A large species connecting the higher species with those of which *E. hypochraria* is the type, the wings being entire. Fore wings slightly falcate, entire, obtusely angled in the middle. Hind wings slightly tridentate, the apex and middle angle being obtusely acute, with a minute tooth between which may be easily overlooked. Body and wings pale ochraceous, densely mottled with tawny brown; lines broad, tawny brown; the inner one curved regularly, not angulated, sometimes nearly obsolete; outer line oblique,

curved; wing shaded beyond with tawny; a submarginal row of pale, irregular spots, often obsolete, connecting with a pale, apical, oblique streak (sometimes not present); wings beyond the outer line tawny-brown, more or less mottled with paler patches, and with a few scattered black scales. Hind wings with sometimes a faint, diffuse, inner line; outer line merged in with the darker border of the wing, faintly doubled, the inclosure being rather small; discal dots black, a little larger and more distinct on the hind wings than on the fore wings. Beneath, pale ochreous, both wings uniformly mottled all over; the outer border of the wings being the same as within; no inner line; the common outer line very distinct tawny-brown, curved as above and on the hind wings doubled in the middle, and sometimes shaded beyond irregularly with tawny; discal dots indistinct. Hind tibiae swollen; legs pale, mottled sparingly with dark.

Length of body, ♂, 0.70–0.80, ♀, 0.70; of fore wing, ♂, 0.70–0.90, ♀, 0.96; expanse of wings, 1.80 inches.

Brunswick, Me., frequent in July and August (Packard); Massachusetts (Sanborn, Minot, "Aug."); New York (Meske); Roxbury, Mass., middle of August (Minot); New Jersey (Sachs); Missouri, May (Riley); near Mammoth Cave, Ky., April 29 (Sanborn, Ky. Geol. Surv.).

It is easily known by the large non-serrate wings, its large size, and pale ochreous color, with the submarginal row of pale spots, and nearly entire hind wings. The outer line on the fore wings of the female is straighter than in the male.

It differs from *E. effectaria* Walk. in the outer edge of the fore wings being entire, and the hind pair being tridentate instead of seven-toothed, with no teeth behind the middle of the wing. The outer third of the wing is fuscous, the outer line being merged into this part and not so distinct nor doubled, as in *E. effectaria*. The basal line on the hind wings is much shorter and broader and is more diffuse. The antennae and legs are darker than in that species, though the head and palpi are of nearly the same tint.

ENDROPIA VINULENTARIA Grote and Robinson. Plate 12, fig. 14.

Endropia vinulentaria Grote and Rob., Ann. Lye. Nat. Hist., viii, pl. 15 A, fig. 5, ♂, 1867.

2 ♂.—This species, in the shape of the wings, is almost identical with *E. madusaria* (*vinosaria*), but the wings are uniformly pale chocolate-brown, being less mottled with brown than usual. The fore wings are moderately falcate compared with the higher species, and entire, while the hind wings

are once excavated below the apex, but not dentate. Fore wings uniformly pale chocolate-brown, with two reddish-brown lines, the inner much curved, with a projection on the median vein (sometimes obsolete); the outer line is straight, slightly curved on the costa; in one specimen, the wing is much paler within the extradiscal line than without; in another, it is of exactly the same hue; fringe concolorous with the lines; a distinct, whitish, oblique apical patch; discal dots distinct on both wings, black. Hind wings with a faint inner line, obsolete in one example; the outer line is straight, double beneath but not above. Beneath, whitish, speckled finely with reddish-brown; on the fore wings the outer edge beyond the extradiscal line with a large, oblique, apical, whitish patch; the extradiscal line is double, but the oval area is one-half narrower than that inclosed on the hind wings.

Length of body, ♂, 0.50–0.60; of fore wings, ♂, 0.60–0.68; expanse of wings, 1.20–1.40 inches.

Massachusetts (Grote): Hyde Park, near Boston, Mass., June 15 (Morrison).

This very pretty species differs from *E. madusaria*, or from *E. marginata*, in the uniform chocolate-color, which is not broken by paler patches and spots. The form of the wings is exactly as in *E. madusaria*. It also differs in the extradiscal line being simple in both wings, not doubled as in *E. madusaria*.

ENDROPIA TEXTRINARIA Grote and Robinson. Plate 12, fig. 15; larva, plate 13, fig. 10; pupa, 10 *a*.

Endropia textrinaria Grote and Rob., Ann. Lye. Nat. Hist., vii, plate 15 *x*, fig. 6, 1867.

3 ♂.—This species differs from all the foregoing and from *madusaria* in the broader wings, the rather shorter body, the tip of the abdomen not reaching to the anal angle of the hind wings, in the much shorter palpi, and in the peculiar arrangement of the two lines on the fore wings, the hind wings being caudate rather than scalloped. Body and wings pale ochreous; front concolorous on the lower two-thirds, above dark brown; vertex like the rest of the body. Antennæ pectinated broadly to near the tip. Wings densely mottled and strigated with brownish-ocher, giving a somewhat checkered appearance to the clearer portions. Veins ochreous-brown. An inner, curved, pale-brown line, bent outward on the submedian vein, and meeting the outer line, which either runs very near, or, if remote, throws out a connecting streak, in the former case forming an oval, with the end resting on

the inner margin of the wing. Outer line dusky fawn-brown, oblique, curved outward above and below inward to meet the inner. Beyond, the wing is shaded with ochreous-brown (with a few black specks); this shade sometimes extends to the border of the wing, interrupted by a submarginal row of irregular pale patches proceeding from the broad, apical, diffuse, pale patch. Discal dots black, distinct in both wings. Hind wings marked like the anterior pair, the outer line situated just in the middle of the wing and nearer the discal dot than usual. Fringe fawn-brown. Beneath, a submarginal scalloped fawn-brown line not reaching the hind edge, common to both wings. (This and the meeting of the two lines on the fore wings above is characteristic of this species.) The rest of the wings is paler than above, with less dense strigae, and darker along the costa. Discal dots distinct. The outer line on the fore wings faintly re-appears through.

Length of body, ♂, 0.45–0.50; of fore wing, ♂, 0.65–0.75; expanse of wings, 1.50 inches.

Mount Washington, N. H., July (Morrison); Philadelphia (Amer. Ent. Soc.); Georgia (Harris Coll.).

The two males from Philadelphia are much clearer above than Mr. Grote's types, the hind wings being especially clear, with long linear strigae.

This is a very well-marked species, and need not be confounded with any other. The hind wings are distinctly "tailed", not sinuated, as in *madusaria*, while the fore wings are distinctly excavated, but not dentate below the apex, and they are shorter and broader than usual.

Larva.—Ramiform; head no wider than the body; a dorsal hump on the third thoracic segment, in the middle of the body, and two on the end of the body. Head rust-red. Body green, with three or four transverse reddish stripes on each abdominal ring. Pupa pale brown, speckled with black. Food plant *Urtaria perfoliata* (described from Abbot's MS. drawing). It is possible that the larva here figured may be that of *Eutrapela transversata*, or *vice versa*, compare fig. 20.

ENDROPIA MADUSARIA Walker. Plate 12, fig. 16.

! *Endropia astylasaria* Walk., List Lep. Het. Br. Mus., xx, 152, 1860.

Endropia madusaria Walk.!!! (fide Grote), List Lep. Het. Br. Mus., xx, 153, 1860.

Endropia opuncaria Walk.!!!, List Lep. Het. Br. Mus., xx, 153, 1860.

Endropia rinosaria Grote and Rob.!!!, Ann. Lye. Nat. Hist., viii, pl. 15 a, fig. 4, ♂, 1867.

4 ♂.—Closely allied to *E. vinulentaria*, but whitish-ochreous; fore wings of the same shape, but hind wings not so deeply notched, and the abdomen

does not extend quite so far behind the wings. Body and wings whitish-ochreous. Fore wings thickly speckled with coffee-brown scales; inner line curved and angulated rather more distinctly than in *vinulentaria*, forming a distinct tooth on the median vein. Outer line (like the inner, coffee-colored) is more curved, especially on the hind edge, than in *vinulentaria*, and is distinctly duplicated in the middle. The wing beyond is uniform coffee- (with milk-) color, and inclosing an oblique, long, narrow, apical, whitish spot, and a large, long, oval spot in the middle of the wing interrupted by the first and second veins, which are brown. Hind wings with a basal straight shade; outer line very distinct, duplicated, inclosing an unusually large, narrow, oval area; beyond not darker than the rest of the wing. Fringe dark, coffee-colored. Beneath, pale whitish-ochreous, with the lines clearly reproduced as above, discal dots more clear than above, outer edge of fore wings scarcely darker than within, on the hind wings concolorous with the rest of the wing. Fringe coffee-colored.

Hind wings as in *vinulentaria*, but considerably less dentate.

Length of body, ♂, 0.50–0.63; of fore wing, ♂, 0.55–0.72; expanse of wings, 1.15–1.60 inches.

Philadelphia (Grote, Ent. Soc.); Lawrence, Kans. (Snow); Colorado Springs, Colo., July 4 (Mead); Texas, May 4, July 10–11 (Belliege).

While there is no doubt but that this species is Walker's *madusaria* and *oponearia*, I think that from Walker's description it is probably his *astylusaria* also, as *modusaria* is a widely-diffused, common, and variable species. It is evidently double-brooded in Texas.

ENDROPIA AMENARIA Guenée. Plate 12, fig. 17.

Endropia amatoria Guen., Plaid., i, 124, pl. 3, fig. 8, 1857.

Walk., List Lep. Het. Br. Mus., xx, 150, 1860.

Endropia arefactaria Grote and Robt!!! Ann. Ent. Nat. Hist., viii, pl. 15 A, fig. 7, 1867.

2 ♂ and 1 ♀.—Brighter ochreous than any other species known to me, and at once distinguished by the two large broad teeth on the apical half of the hind wings, the incision between being unusually deep. Fore wings with an acute subfalcate apex; outer edge of the hind wings bent but not scalloped, with two large prominent, though not very acute, teeth, straight behind the middle. Fore wings and body yellow-ochreous, speckled with heavy black strigæ. Palpi tipped with black beneath, and antennæ conspicuously speckled above. Fore wings with the inner line curved and angulated; this and the

outer line dark brown. Outer line oblique, curved toward the costa, with no tendency to double itself, and quite distinct from the border of the wing, beyond which it is rusty-ochreous, growing slightly paler toward the edge of the wing. A large, pale, irregularly oval, apical spot, one of a series of smaller irregular ones, ending just within the hind angle. Fringe dark. Hind wings with a very faint basal shade (not present in two of the specimens). Outer line straight, or but slightly curved, duplicated in the middle, but inclosing a smaller area than usual. Shaded a little way beyond the line, and on the apical portion with rusty-ochreous; edge of wing below pale ochreous. Beneath, deeper ochreous than usual, the outer common line alone prominent, dark brown. Wings ochreous, heavily speckled with black scales. Submarginal row of pale spots distinct, but not present on the hind wings. Border partially shaded, especially on the fore wings and apical region of the hind wings.

Length of body, ♂, 0.60–0.70, ♀, 0.55; of fore wing, ♂, 0.63–0.70, ♀, 0.90; expanse of wings, 1.90 inches.

This well-marked species may at once be known by the two large, broad, triangular teeth on the hind wings, the unusually bright-ochreous colors, and the row of submarginal, pale, irregular spots near the outer edge of the fore wings.

Springfield, Mass. (Dimmock); New York (Grote and Meske); New Jersey (Sachs); Philadelphia, Pa. (Ent. Soc.).

This agrees perfectly with Guenée's description, but not with his figures, which are usually poor. My description is partly based on Messrs. Grote and Robinson's type. Walker's *E. propriaria* (List, xx, 249, 1860) seems to be this species.

ENDROPIA ARMATARIA Packard. Plate 12, figs. 19, 20.

Guophos armataria H.-Sch., Ausseureur, Schin., 65, figs. 373, 374, 1850-58.

Prionocyta armataria Guen., Phal., i, 91, 1857.

Walk., List Lep. Det. Br. Mus., xx, 114, 1860.

4 ♂ and 1 ♀.—Antennae not so heavily pectinated as usual. Fore wings falcate, rather short, outer edge decidedly serrate, hind wings deeply and regularly so. Fawn-brown, with a violet tinge, especially on the outer half of the hind wings. Inner line on the fore wings rather broad, dark brown, very oblique, and bent at a high angle just below the costa. The extradiscal line is a broad band, somewhat sinuous. The wing beyond is as clear as in

the middle, with a dark broken patch on the inner angle, and a subapical dark-brown shade lining the deep subapical excavation. Hind wings with two broad extradiscal bands, the outer diffuse; the wings on each side washed with violet. Beneath, bright ochreous-yellow; a common brown line, beyond which the wing is of the color of a dried leaf, especially on the hind wings, the edges of which are yellow-ocher. In the female, the bands are narrower.

Length of body, ♂, 0.60; of fore wing, ♂, 0.65; expanse of wings, 1.30 inches.

Brunswick, Me. (Packard); Boston, Mass. (Sanborn and Harris Coll.); New York (Grote and Angus); Maryland (Mus. Comp. Zool.); Missouri (Riley).

This common and very well-marked species is smaller than most of the others of the genus, and may be readily recognized by the heavy broad band common to both wings, the violet tinge of the secondaries, and the bright deep ochreous under side.

An individual (fig. 20, ♂) from Maryland, in the Museum of Comparative Zoölogy, is of a peculiar dark umber-brown, with the lines and bands less oblique, and of the same hue beneath; but, as the antennæ and shape of the wings are the same, I am inclined to regard it as a much suffused melanotic individual.

ENDROPIA BILINEARIA Packard. Plate 12, fig. 21.

Prionocla bilinearia Pack., New and Little Known Insects, 13, 1870.

10 ♂ and 10 ♀.—Clear fawn-brown; wings much darker and less spotted than in the other species. Body and wings concolorous; front of the head and the palpi a little darker than the rest of the body. Costa of the fore wings paler than the rest of the wing and spotted finely, especially on the edge, with brown specks. Two brown hair-lines, the inner situated on the basal, and the outer on the outer third of the wing; the inner line bent on the costa, where it is a little incurved, then going straight to the inner edge of the wing. Outer line a little curved outward in the median spaces. Half-way between this line and the outer edge of the wing is a diffuse, interrupted, faint grayish band with a few dark scales, often wanting, and connecting with an oblique apical patch, also concolorous with the costa. Outer edge of the wing deeply notched; the eight acute points (including the apex, which is very acute) tipped with a few black scales, the fringe being whitish between. A faint discal dot sometimes wanting. Hind wings with a faint, basal, diffuse band often wanting.

being much more distinct beneath); a median brown hair-line; fringe as in the fore wings. Beneath, body and wings ocher-yellow, especially in the middle of the wings. Both wings marked alike with a basal, diffuse, broad, brown line, and an outer, much curved, brown hair-line. An outer row of dark patches forming a faint broken line. An apical, oblique, whitish patch. Beyond the outer hair-line, both wings darker. Hind edge of fore wings with darker spots and patches than elsewhere. The female is of nearly the same form as the male, but with much larger deeper notches. On the under side, the costa and hind edge are gray, with blackish scales. Discal dot distinct above, larger beneath. Inner band wanting. Beyond the outer line, the wing is fawn-brown, more as above, and the entire under surface is more thickly speckled than in the male. On the upper side of the fore wings are three dark patches, one at the inner angle and two near the apex.

Length of body, ♂, 0.65; of fore wing, ♂, 0.70, ♀, 0.63–0.73; expanse of wings, 1.30–1.65 inches.

Canada (Saunders); Brunswick, Me. (Packard); Brookline, Mass., July 17 (Shurtleff); Massachusetts (G. Dimmock); New York (Lintner and Grote); New Jersey (Sachs); Glencoe, Nebr. (Dodge); Lawrence, Kans. (Snow); Waco, Tex., May 5, August 29 (Belfrage); Sierra Nevada, Cal. (Edwards); Victoria, Vancouver's Island (Crotch, Mus. Comp. Zool.).

This species is larger and differently marked from *E. armataria*, and is not so acutely dentate on the outer edge of either pair of wings, which are uniformly clear fawn-brown, with darker lines, but not the broad heavy bands of *armataria*. The two male and female specimens from Vancouver's Island and one male from California follow the usual law of variation of intercontinental species, and are much larger than eastern examples; but the markings are essentially the same, the dark patches on the outer margin of the fore wings being well marked.

Length of fore wing of a Massachusetts example, 0.70; of a Vancouver's Island specimen, 0.85 inch.

The Nebraska and Kansas specimens do not differ in size from eastern ones.

Larva.—The caterpillar has been found by Mr. W. Saunders feeding on the oak. Unfortunately, it was not described. It went into the chrysalis state on the 4th of July, and on the 17th, or thirteen days after, emerged.

ENDROPIA PECTINARIA Guenée. Plate 12, figs. 11-14, 18, ♀

Geometra pectinaria Den. and Schiff., Wien Verh., fig. 6, 163, 1776.

"Hübner, Schin. Eur., Geom., tab. 6, fig. 30, mas."

Ennomos pectinaria Trötsch, Schin. Eur., VI (10), 66, 1827.

Dupon, Lep. France, vii-ix, 1, 167, pl. 115, fig. 1, 1829.

Boisd., Gen. Ind., 183, 1849.

Endropia pectinaria Guenée, Phil., i, 122, 1857.

Walk., List Lep. Het. Br. Mus., xx, 149, 1860.

Endropia didactaria Walk., List Lep. Het. Br. Mus., xx, 151, 1860.

3 ♂ and 3 ♀.—Closely resembles *E. serrataria* in size and markings; the wings are however less scalloped, the teeth in the hind wing between the apex and middle of the wing being shorter and more obtuse; the apex of the fore wings is similarly acute. Body and wings deep ochreous, much as in *E. amaurina*, and wanting the dark hue on the outer border of the wings, which is nearly as clear as the middle and base. Two fawn-brown lines on the fore wings, the inner much curved, straight between the subcostal and median vein, and bent on the costa. Outer line curved, with a tendency to become doubled in the middle in the male but simple in the female; shaded outside diffusely with the same color as the line itself in the male but not in the female. Discal dots black, distinct on both wings. Wings speckled with black strigæ; apex of fore wings quite clear, with a dark oblique shade, the outer border clear. In one female, there are two rather large submarginal black spots in the middle of both wings; and in one male a pale rust-red one in the second median cell, and one on the hind wing larger and enveloping the second median vein. Fringe darker than the rest of the wing. On the hind wings the common line is duplicated on the hind edge, and again in the middle; a basal, diffuse, straight line is present. Beneath as above, but the lines are darker and more distinct, and the fringe darker, and the strigæ coarser than above. The hind tibiae swollen; legs concolorous with the body, speckled with black-brown. Palpi tipped with black scales beneath.

Length of body, ♂, 0.75, ♀, 0.60; of fore wing, ♂, 0.72, ♀, 0.77; expanse of wings, 1.50-1.60 inches.

West Farms, N. Y. (August); Missouri (Riley); Lawrence, Kans. (Snow).

It may be known by the three well-marked teeth on the apical half of the hind wings, the clear border, and clear dark lines beneath; otherwise it is much like *E. effictaria*. The artist has wrongly put pectinated antennæ on the figure of the female (fig. 18). The male is well represented by Dupon-

chef's figure. In the female, the common line is straight and not doubled, and the wings are speckled with dark blotches.

The fourth of Walker's types of this species is a *Selenia*.

Larva.—"The caterpillar lives on the oak and other trees. It is of a testaceous gray, with a dorsal lozenge-like mark. The fourth segment is deeper-colored, and on the back of the 8th, 9th, and 10th, are also two obscure marks bitid anteriorly on the first, and carrying a blackish angle (*arcte*) on each extremity of the second. The head and feet are concolorous. It is found in May and June, and the moth is disclosed towards the end of this last month. A second generation spins (*file*) toward the middle of July to appear as moths in the beginning of August."—(Gueneé.) This description is probably taken from figures of Abbot or of LeConte drawn in Georgia. In the Northern States, the species is undoubtedly only single-brooded.

ENDROPIA EFFECTARIA Walker. Plate 12, figs. 22, 24.

Endropia effectaria Walk., Can. Nat., v, 260, 1860; List Lep. Het. Br. Mus., xxvi, 1504, 1862.

4 ♂ and 5 ♀.—In its form and the cut of the serrated wings closely resembling *serrataria*, but the wings, while being scarcely more acutely pointed, are more deeply serrated, especially on the hind wings, which appear as if deeply slit in some specimens. Deep fawn-color with black specks, frosted with gray on the body and the costa of the fore wings, as well as on the basal half of both wings; being darker brown than usual (rubbed specimens with an ochreous tinge). The base of the wings but little paler than the border. Antennæ deeply pectinated; palpi long, paler at tip. Fore wings with a basal, dark-ferruginous, narrow line, a little curved, just beyond an oblique dark shade, straight, and extending on to the hind wing, forming the basal line of the wing (the inner line varies in being sometimes very diffuse, and the outer, oblique, straight shade is usually rubbed off the fore wing). Outer common line usually darker than the border of the wing beyond, oblique, often sinuate, and on the hind wings doubled in the middle of the wing, the inclosed portion being lanceolate-oval. A row of paler spots often extends from the apical pale patch to just within the inner angle (this row often obsolete), sometimes present on the hind wings. Fore wings acutely falcate, with six or seven obtuse teeth, two behind the median bend, the male being nearly as acutely serrated as the female, and with the fore wings and apex nearly as acutely pointed. In the hind wings, the teeth in the male are

very large, the third tooth especially being long and often twice as large as the others. Beneath, paler than above; wings and legs thickly speckled with large transverse strigæ with a rusty tinge. The lines are very distinct, broader, and the marginal row of diffuse humules more distinct than above; fringe rusty-brown; edge of wing paler gray than in the middle, in the female decidedly frosty-gray, and contrasting well with the rest of the wing. More common northward than *serrataria*.

In some specimens is a subapical row of two or three round black spots. Discal dots either distinct or obscure, and almost obsolete. Mr. Walker's type is not in the British Museum; but his description, brief as it is, applies well to this species.

Length of body, ♂, 0.70–0.80, ♀, 0.55–0.80; of fore wing, ♂, 0.80–0.90, ♀, 0.80–1.00; expanse of wings, 2.00 inches.

Canada (Walker): Brunswick, Me., July, August, frequent (Packard); Massachusetts (Sanborn, Stratton); Amherst, Mass. (Peabody); Brookline, N. Y., July 16 (Shurtleiff); Albany, N. Y. (Linnær); Oneida, N. Y. (Hawley); New Jersey (Sachs); Detroit, Mich. (Swartz).

This species is one of the largest of the genus, and, though exceedingly variable, may usually be determined by the very deeply serrate wings, by the rusty-ochreous hues, the irregular, dentate, not very distinct lines, and by the ochreous under side, mottled, however, with rust-brown. While in the form of the wings it is much like *serrataria*, in coloration *E. obtusaria* is more likely to be mistaken for the former. I append the description of an unusual form from Illinois:

1 ♂.—Fawn-color, with diffuse dark-brown bands; beneath, with an ochreous tinge. Body fawn-color like the wings; a broad, diffuse, curved, basal band (often obsolete); a similar mesial band not much curved, crossing the site of the discal dot, which is obsolete. The outer line is broad, diffuse, dark brown, becoming paler externally; it is straight to just before the costa, where it curves, though it is not angulated; between the inner and outer lines the wing is tinged with ochreous; beyond the outer line the border is fawn-colored, with dark strigæ; edge more ochreous, fringe darker. An apical oblique dark streak, concolorous with the three lines; edge of the wing scalloped slightly, apex very acutely produced. Hind wings deeply indented, both acute, tinged with ochreous within the outer line; beyond, fawn-color, with more numerous and distinct strigæ than toward the base of

the wing: the two lines are nearly parallel, the outer ones doubled mesially. Beneath, the wings are more deeply ochreous, with thick strigæ; beyond the outer line, which is doubled in the middle, the margin is fawn-colored, and a little paler toward the apex. On the secondaries, the same basal common line is broader than the outer line, which is doubled. Length of the body, 0.60; fore wing, 0.84 inch. Illinois (Dr. B. Clemens).

ENDROPIA OBTUSARIA Guenée. Plate 12, fig. 23.

"*Geometra obtusaria* Hübn., Geom. Eur., 230."

Euchlona obtusaria Hübn., Verz., 293, 1818.

Endropia tiprinaria Guen., Phal., i, 123, 1857.

Endropia mazarina Walk., List Lep. Het. Br. Mus., xx, 154, 1860.

4 ♂ and 4 ♀.—This is nearest allied to *E. serrataria*, but differs in being paler (or sometimes dark brown), whitish-ochreous, with the border of the wings much paler, sometimes concolorous with the rest of the wings, and the under side is pale, thickly spotted with brown specks. Antennæ not so heavily pectinated as in *serrataria*. Head, body, and wings concolorous, whitish-ochreous. Fore wings clear at the base; an inner, curved, narrow, pale fawn-brown line, often obsolete; outer line oblique, much curved opposite the discal dot, not confused with the shade on the border of the wing, as in *serrataria*, but distinct, and bent at nearly right angles opposite the discal dot, whence it goes to the costa; the line is in one specimen sinuate. Discal dots in both wings black, large, and distinct. Border of both wings pale fawn-brown, or coffee-(with milk-) color, or obsoletely so, being in one male concolorous with the rest of the wing. A dark apical streak, with often three rounded blackish spots or lunules in the three interspaces below. Hind wings like the fore wings, with an inner faint line (often obsolete) running near the discal dot, and the outer line darker than the brown portion beyond, sometimes duplicated in the middle (when the part is not obsolete). The male with the apex as acute if not more so than in *serrataria*; middle angle disposed to be more marked than in *serrataria*. Hind wings with deeper notches, with four projecting teeth.

The females are a little more deeply angulated than in *serrataria*; teeth arranged the same. The under side of the wings is much paler than in *serrataria*, and uniformly and densely speckled. Border of the wings but a little darker (in some no darker) than the rest of the wing. Lines and discal dots very distinct; the inner common line broad and diffuse, and run-

ning next to or actually inclosing the discal dots. A smaller species than *serrataria*. The breadth of the coffee-colored border varies sometimes, as in a Kansas specimen which is dark coffee-brown, with the outer third of the the wings but a shade darker than the interior.

Length of body, ♂, 0.55–0.80; ♀, 0.65; of fore wing, ♂, 0.72–0.85; ♀, 0.90; expanse of wings, 1.60–1.80 inches.

Amherst, Mass., June (Peabody); Boston, Mass. (Sanborn); Maryland (Mus. Comp. Zool.); Albany, N. Y. (Lintner); West Farms, N. Y. (Angus); Philadelphia, Pa. (Grote); Illinois (Grote); Ithaca, N. Y. (Smith); New Jersey (Sachs); Missouri (Riley); Lawrence, Kans. (Snow); Texas, March 7, April 21, July 1 (Belfrage).

This is an exceedingly variable species. It is of the same size, and very nearly allied to *E. serrataria*, but is never so yellow, and the wings are less serrate, especially on the posterior half of the hind wings, which in several examples is not serrate at all. Certain females are uniformly pale ash-brown, of the same hue as in *E. rivulataria*, differing in this respect from any of the allied serrated forms. Other females are yellowish-brown, but still much less yellow than in *serrataria*. Usually, however, in both sexes the wings are broadly margined with brown, with two or three black apical spots, and the discal dots are large and distinct. The specimens are always lighter than in *effictaria*, and less yellow than in *serrataria*.

Although it does not exactly agree with Guenée's description of *tigri-naria*, yet it does in the most important characters. He says the extradiscal line is not bent below the costa, but it is usually nearly as much bent as in *E. pectinaria*, though in worn specimens the bend is indistinct. It is evidently his *obtusaria* Hübner, as individuals agree well with his description.

Larva.—Rather thick; body of uniform thickness throughout, with the head no wider than the body, which is smooth, less tuberculated than usual, there being only one or two small dorsal tubercles near the end of the body. The body is pale gray, with brown blotches, and subdorsal series of reddish longitudinal lines. Food-plant *Impatiens noli-me-tangere*.—(Described from Abbot's MS. drawings.)

ENDROPIA SERRATARIA Packard. Plate 12, fig. 25.

Geometra serrata Druy., Ill., i, 10; plate 29, fig. 1, 1770; West., ed., i, 38, pl. 29, fig. 1, 1837.

3 ♂ and 8 ♀.—This species differs from all the other species by the body and wings being sulphur-yellow, the hind wings being deeply serrated,

and the outer border of both wings beyond the common outer line being fawn-brown. Head like the body; orbits in front deep ochreous. Antennae broadly pectinated, as usual. Fore wings with a basal, curved, diffuse, fawn-brown band, the wings being often brown at base; an extradiscal one common to both wings; discal dots not very distinct; wings obscurely spotted with fawn-brown; outer line fawn brown; the wing beyond is filled up with the same color, with an oblique, apical, yellowish patch, shaded below with blackish, and with scattered black specks on the brown portion. Hind wings like the anterior pair, except that there is no basal line; apex very acute in the female. Outer edge of the fore wings of the male angulated in the middle, but not scalloped, as it is in the female. Hind wings deeply serrated in the male in front of the middle of the wing, there being three acute points, while in the female the entire edge is scalloped, there being six acute points. Beneath, the markings re-appear, the wings are more heavily speckled, discal dots larger, black, more distinct; both common lines present; outer border brown, but paler than above, and with the apical oblique patch more distinct. Legs yellow, spotted with lilac-brown.

Length of body, ♂, 0.70–0.80, ♀, 0.65–0.70; of fore wing, ♂, 0.75–0.85, ♀, 0.90–1.00; expanse of wings, 1.80–2.00 inches.

It varies in the base of the fore wing being brown, or this brown portion is represented simply by a diffuse curved line, and also in the degree of irroration, and of the scalloping of the fore wings.

Montreal, Canada (Lyman); Boston, Mass. (Soc. Nat. Hist., Sanborn, Stratton, and Shurtleff, the latter collecting it "July 10th"); Albany, N. Y. (Lintner and Meske); Hastings-on-Hudson, N. Y. (Grote); New Jersey (Sachs); Philadelphia, Pa. (Grote and Ent. Soc.); Detroit, Mich. (Mus. Comp. Zool.); Glencoe, Nebr. (Dodge).

Desiderata.

Endropia tiliaria Walk., List Lep. Het. Br. Mus., xx, 250, 1860.—
"Male. Dull cinereous fawn-color, minutely black-speckled; under side paler and brighter. Palpi brown, porrect, broad, extending a little beyond the head; third joint conical, minute. Antennae broadly pectinated, except at the tips. Legs brown; tarsi pale testaceous. Wings with two dark cinereous-brown lines and with the fringe of the same hue; a black discal point. Fore wings subfalcate; interior line bent and undulating; a whitish oblique

apical streak, which is partly bordered with brown; exterior border convex. Hind wings with a loop line, which joins the outer side of the exterior line.

"Length of the body 6 lines; of the wings 16 lines.

"*a, b.* St. John's Bluff, East Florida. Presented by E. Doubleday, Esq.

"*Female.* Fawn-color. Palpi slightly ascending, extending somewhat beyond the head; third joint very minute. Wings pale testaceous, with very numerous fawn-colored speckles, which are mostly confluent on the outer part, the latter minutely black-speckled; exterior line brown, oblique, nearly straight; discal point black; fringe fuscous-brown; under side with a loop line joining the outer side of the exterior line. Fore wings with a bent interior line and with a broad apical streak; exterior border hardly bent. Hind wings with the apical part of the costa and the fore part of the exterior border somewhat truncated.

"Length of the body 7 lines; of the wings 18 lines.

"*c.* East Florida. Presented by E. Doubleday, Esq."

Endropia adustaria Walk., List Lep. Het. Br. Mus., xxxv, 1545, 1866

"*Male.* Fawn-color, ochraceous beneath. Palpi porrect, pubescent, moderately stout, extending rather beyond the head; third joint conical, not more than one-fourth of the length of the second. Antennae moderately pectinated to the tips. Abdomen not extending beyond the hind wings; apical tuft small. Legs rather short. Wings broad, minutely black-speckled; a black rather large point in the disk, and a brown exterior indistinct slightly undulating line; exterior border very slightly bent in the middle. Fore wings sharply rectangular at the tips; a brown antemedial indistinct line, which is slightly retracted near the costa.

"Length of the body 7 lines; of the wings 18 lines.

"*a.* North America. From Mr. Carter's collection."

Endropia incisaria Walk., List Lep. Het. Br. Mus., xxxv, 1546, 1866.—

"*Male.* Cinereous, with a tinge of fawn-color; under side pale yellowish, brown-speckled. Palpi brown, porrect, smooth, stout, much shorter than the breadth of the head; third joint conical, not more than one-fourth of the length of the second. Antennae rather broadly pectinated to three-fourths of the length. Abdomen extending rather beyond the hind wings; apical tuft very small. Hind tibiae slightly dilated. Wings broad, minutely and transversely blackish-speckled; two blackish oblique lines; first line near

the base, slightly zigzag; second in the middle, slightly retracted near the costa of the fore wings; a black point in the disk. Fore wings acute; exterior border slightly angular in the middle. Hind wings with the exterior border acutely bidentate in front.

"Length of the body 8 lines; of the wings 18 lines.

"*a.* North America. From Mr. Carter's collection."

AZELINA Guenée. Plate 6, fig. 12

Gonodontis Hübn. (in part), Samml. Exot. Schm., ii, 1806.

Hübner (in part), Verz., 287, 1818.

Azelina Guen., Phal., i, 156, 1857.

Walk., List Lep. Het. Br. Mus., xx, 185, 1860.

Head square in front. Antennæ simple, finely ciliated. Body rather stout; abdomen of the male ending in a broad tuft. Fore wings falcate, broad, the costa straight, until near the apex it becomes much curved and the apex is acutely falcate, and below there are three well-marked teeth, the third on the second median venule; below this the edge is entire. Hind wings angular, with three small teeth, of which the central one is the largest. Venation: costal vein free from the subcostal; six subcostal venules, the first two very long and equal in length. No subcostal cell. The posterior discal venule oblique and bent. Hind tibiae not swollen, no longer than the tarsi.

The simple, thickened, slightly-ciliated male antennae, pilose thorax, and finely dentate wings separate this genus from *Selenia*.

Synopsis of the Species.

Reddish or amber brown; band in the middle of the fore wings but slightly darker than the rest of the wing.....*A. hübnerata*.
 Light ash-colored, with a narrow median reddish-brown band, very distinct from the rest of the wing.....*A. behrensata*.

AZELINA HÜBNERATA Guenée. Plate 11, ♂, fig. 58; ♀, fig. 59.

Gonodontis ancetaria Hübn., Samml. Exot. Schm., ii, 1806 (not *anceta* Cram., *vide* Guen.).

Hübner, Verz., 287, 1818.

Azelina hübneraria Guen., Phal., i, 159, 1857.

Walk., List Lep. Het. Br. Mus., xx, 186, 1860.

10 ♂ and 10 ♀.—Reddish-brown, more or less strigated with dark brown. Fore wings with the inner line consisting of three scallops, the first being usually a straight oblique line, extending from the costa out-

ward to the middle of the discal space, thence curving inward on to the median vein, the next point situated on the internal vein. A white, curved, linear, discal spot. The outer line is slightly oblique, nearly parallel with the outer edge, with a deep regular curve inward between the first median venule and the submedian fold. This line is usually shaded with dark or reddish-brown on the inside, and sometimes the entire middle of the wing is dark brown. Beyond the extradiscal line, the wing is paler and clearer, sometimes the strigae are collected into a faint, diffuse, submarginal band. Hind wings a little paler than the anterior pair, with a whitish extradiscal line, shaded with dark scales on the inside, and curved outward in the submedian space. Beyond this line near the inner angle are scattered dark specks, sometimes forming a short, diffuse band. Along the edge of the wing are five distinct black dots, becoming larger toward the inner angle; the fifth one is situated just in front of the largest tooth in the middle of the wing. Beneath, both wings uniformly reddish or umber-brown, with no lines. The discal dot on the fore wings is twice as large as on the hind wings, white, conspicuous; on the hind wings are faint traces of the extradiscal line, especially apparent toward the inner edge. The discal dot is large, oval, black, edged with white. The marginal black dots are present beneath.

Length of body, ♂, 0.70-0.80, ♀, 0.65; of fore wings, ♂, 0.75-0.90, ♀, 0.75; expanse of wings, 1.70-1.80 inches.

Montreal, Canada (Caulfield); Brunswick, Me. (Packard); Boston (Sanborn); West Farms, N. Y. (Angus); Philadelphia, Pa. (Amer. Ent. Soc.); Missouri (Riley); Glencoe, Nebraska (Dodger); Lawrence, Kans. (Snow); California (Edwards and Behrens); Santa Barbara, Cal. (Hartford).

This species is very variable. In the Eastern States, it is often umber-brown as well as reddish-brown. The Pacific-coast specimens are larger than the eastern (the fore wing of a Californian male measuring 0.90, of a Massachusetts male 0.75 inch). The two Santa Barbara males are smaller than usual in Pacific-coast specimens, and paler, and seem to be distinct from *A. behrensata*.

AZELINA BEHRENSATA Packard. Plate 11, fig. 60.

Azelina behrensaria, Pack., Proc. Ent. Soc. Nat. Hist., xiii, 386, 1871.

♂.—Closely allied structurally with *A. habuata*. Ash granite gray. Head and body granite-gray, abdomen darker; a dark line on the hinder

edge of each abdominal segment; thorax very hairy, with a prominent median crest. A broad, fawn-colored, brown band in the middle of the fore-wings, limited by the inner and outer line, which are dark black-brown and very distinct; inner line curved just below the costa, and slightly sinuate below the median vein; outer line sinuate as in *hübnerata*, having a deep curve inward in the middle of the wing, and another near the inner edge, and oblique on the costa. Beyond this line, the wing is ash-gray as at the base, with a large, oval, diffuse, fawn-brown spot, extending from near the internal angle to the middle of the wing. Edge of the wing a little darker than next to the outer line; a dark line at the base of the fringe. In the hind wings, which are pale ash-gray, the single outer line is nearer the outer edge than in *A. hübnerata*, and is a little more sinuate. Base of the fringe lined with black, and four black, diffuse, intervenous spots, very unlike the large distinct ones of *A. hübnerata*. On the fore wings, a large, curvilinear, white, discal dot, lined within with black scales. Beneath, uniformly pale-ash; discal dot more diffuse than above, with a black dot within.

Length of body, 0.65; of fore wing, 0.73; expanse of wings, 1.50 inches.

California (Behrens).

At once known by the broad fawn-brown central band on the fore wings, contrasting with the pale granite ash-gray of the rest of the wings and body, and by the clear, large, discal dot. Antennæ a little slenderer than in *hübnerata*.

Desiderata.

Gonodontis peplaria Hübner and Geyer, Zutr. Exot. Schm., 27, figs. 709, 710, 1832.

Azelina? zalissaria Walk., List Lep. Het. Br. Mus., xx, 187, 1860 — "Male. Brownish cinereous. Frontal tuft prominent. Third joint of the palpi very minute. Antennæ moderately pectinated, simple toward the tips. Thorax slightly crested. Abdomen extending beyond the hind wings. Wings slightly and minutely speckled with black. Fore wings subfalcate, with a straight oblique blackish-brown exterior line, which is concise on the outer side but very diffuse on the inner side; a blackish-brown streak extending obliquely outward to the disc from the basal part of the costa; exterior border with two slight angles. Hind wings with a slight line, which

corresponds to the line of the fore wings, and is obsolete in front; exterior border distinctly angular, with two hindward submarginal black points. Length of body 7 lines; of wings 15 lines. — East Florida.”

This is a valid species, and a true *Azelina*. — It is figured at plate 13, fig. 56. — It may prove to be a variety of *Azelina habuvarata*.

Azelina cedaria Walk., List Lep. Het. Br. Mus., xxxv, 1548, 1866.

“*Male*. Cinereous, with a slight tinge of ochraceous, the latter hue most prevalent on the under side. Head and fore part of the thorax fawn color. Palpi porrect, slender, pubescent, extending a little beyond the head; third joint very minute. Antennae broadly pectinated to the tips. Abdomen not extending beyond the hind wings; apical tuft small, compressed. Wings minutely and transversely brown-streaked; a broad undulating greenish-brown band which contains a dark brown line; the latter forms an outward angle in each wing and is purple-bordered on the outer side; a blackish point on the inner side of the line; marginal festoon brown; under side with ochraceous streaks, and with an undulating rosy line, which in the hind wings and in the hind part of the fore wings is broadly bordered with white on the outer side. Fore wings rectangular at the tips; basal part mostly greenish brown; exterior border very slightly angular in the middle. Hind wings with the fore part of the exterior border undulating.

“Length of the body 7 lines; of the wings 18 lines.

“*a*. North America. — From Mr. Carter’s collection.”

Azelina stygiaria Walk., List Lep. Het. Br. Mus., xxxv, 1548, 1866.—

“*Male*. Blackish, cinereous beneath. Palpi pilose, rather stout, slightly ascending, hardly extending beyond the head; third joint extremely short. Antennae very minutely serrated. Abdomen not extending beyond the hind wings; some small tufts along each side; apical tuft subquadrate. Legs slender. Wings broad, minutely black-speckled; a broad cinereous marginal band; exterior border acutely angular in the middle, festooned in front; under side with a whitish zigzag postmedial line, and with a mark in the disk, which mark is whitish in the fore wings and black in the hind wings. Fore wings very acute, with two black undulating lines; first line antemedial, retracted and more conspicuous towards the costa; second postmedial diffuse on the inner side, very concise on the outer side; a slender oblique white streak in the disk between the lines. Hind wings dark cinereous, which

line is divided from the paler marginal band by a blackish slightly undulating line; three black marginal dots and two black submarginal points, the latter nearer than the former to the costa.

"Length of the body $7\frac{1}{2}$ lines; of the wings 20 lines.

"*a.* North America. From Mr. Carter's collection."

SELENIA Hübner. Plate 6, fig. 17.

Selenia Hübner, Verz., 292, 1818.

Ennomos Treits. (in part), Schum. Eur., vi (i), 3, 1827.

Dup. (in part), Lep. France, vii (iv), 136, 1829.

Giconetra Steph. (in part), Nomencl. Br. Ins., 13, 1829.

Ennomos Boisdu. (in part), Gen. Ind., 182, 1840.

Dup. (in part), Cat., 218, 1844.

Selenia H.-Sch. (in part), Schum. Eur., iii, 46, 1847.

Odoptera Steph. (in part), Cat. Br. Lep., 165, 1850.

Selenia Lederer, Verh. Bot. Zool. Ges. Wien, 176, 1853.

Guen., Phal., i, 150, 1857.

Walk., List Lep. Het. Br. Mus., xx, 181, 1860.

Head much as in *Endropia*, but with the frontal scales projecting more between the palpi, which are large and stout, extending as far beyond the front as in *Endropia*, but with the joints less distinct; the third joint a little depressed. Male antennæ heavily pectinated, as in *Endropia*; in the female simple. Thorax thick, hairy. Fore wings with the costa sinuous, falcate; outer edge with a large conspicuous angle, and serrate in front of and behind it, a little excavated below the apex. Hind wings distinctly serrate and dentate, with no prominent angle in the outer edge; they reach slightly beyond the tip of the abdomen. Venation: much as in *Endropia*, the costal vein free; the first and second subcostal venules free, equal in length, the third unusually short, the fifth rather short. No subcostal cell; the anterior discal venule short and much curved; the posterior one very oblique. Hind legs with the tibiæ scarcely swollen, and the tarsi large and as long as the tibiæ. The abdomen is rather stout. Coloration: ochreous-brown, tinged on the costa, along the extradiscal line, and on the under side with violet. Fore wings with three parallel lines.

In this genus, besides its peculiar style of coloration, the falcate wings and serrate outer edge, the hind tibiæ are not swollen as in *Endropia*, and the hairs on the front project more, while the posterior discal venule is remarkably oblique. It is more nearly related to *Endropia* than any other, and, as in that genus, the wings of the female are broader and a little more falcate than in the male.

Synopsis of the species.

Hind wings slightly dentate.....	<i>S. alciphœaria</i> , ²
Hind wings distinctly dentate.....	<i>S. kentaria</i> .

SELENIA ALCIPHÆARIA Walker. Plate 12, fig. 27.

Selenia alciphœaria Walk., List Lep. Het. Br. Mus., xx, 184, 1860.

2 ♂.—Ochreous; whitish on the costa; front and middle of prothorax light gray; edges of front ochreous; palpi very stout, long, porrect, extending far beyond the front; tips very conical, paler; antennæ dark ochreous, with stout, dark pectinations; fore wings with two brown lines, the inner nearly straight, enlarged upon the costa; a broad, mesial, diffuse, brownish, indistinct shade common to both wings; discal dot nearly obsolete; the outer line is brown, curved slightly inward, straight and enlarged on the costa; a submargino-apical, waved, brown line, which does not extend to the mesial angle, bordered on the inside with cinereous; outer edge dark ochreous, with ferruginous scales; entire wing strigated with ferruginous; costal half pale whitish; fringe white between the points; on the secondaries no brown linear bands as on the fore wings; outer half of the wing brighter ochreous than toward the base. Beneath, a common, whitish, slightly purplish line, very slightly sinuate; the mesial, common, diffuse band is also present; discal dots white, angular, diffusely grayish on the outer line, and beyond are a few grayish scales, which extend on to the mesial angle, while above and below the border is ferruginous.

Length of the body, ♂, 0.52; of fore wing, ♂, 0.72; expanse of wings, 1.90 inches.

Hudson Bay Territory (Coll. Grote); Alaska (Behrens).

This form differs from *S. violascens* in not being violaceous above, though slightly so beneath; the two lines are much more distinct and not edged with paler tints, and the hind wings above are not lineated mesially. It may also be recognized by the hind wings beneath having the outer line straight, while the pectinations of the antennæ are black. The two species are readily distinguished by the inner line in the present species being straight, while in *kentaria* it is bent at nearly right angles, and in the latter the hind wings are distinctly serrate.

SELEXIA KENTARIA. Plate 12, fig. 26.

Pericallia kentaria Grote and Robt., Trans. Amer. Ent. Soc., i, 12, pl. 1, fig. 5, 1867.

2 ♂ and 1 ♀.—Bright ochreous, with the costal half of the wing subviolaceous between the brown lines; a much-curved line, terminating at the same distance from the base on both the costa and the hind edge; a mesial line, obtusely angulated below the costa, straight from the hind edge to the median nervure; a third outer line, straight to the obscure angle just before the costa, and on the edge turned obliquely outward; this line is margined for nearly the whole of its length externally with a subviolaceous hue, throwing off an oblique line toward the hind angle. An apical line, once angulated inward, goes to the indented outer border; beyond, deep ochraceous; fringe darker at base, narrowly lined with silvery. Hind wings concolorous with the fore wings; a mesial, diffuse, brown line, and the outer one subviolaceous. Beneath, base of fore wings violaceous; costa at base ochreous; inner line nearly obsolete, middle line dark, outer violaceous line very distinct, the apical line connected with it and inclosing an ochreous spot; hind wings ochreous; a mesial, dark, blackish, narrow line on the discal space; an outer, narrow, violaceous line, with spots on the base and hind edge; body ochreous; legs broadly banded with violaceous.

Length of body, ♂, 0.50, ♀, 0.55; of fore wing, ♂, 0.70, ♀, 0.78; expanse of wings, 1.50–1.60 inches.

Mount Washington, N. H., July (Morrison); Brookline, Mass., July 29 (Shurtleff); Seekonk, Mass. (Mrs. Brigham); Lawrence, Kans. (Snow).

Certain larger individuals differ in some respects, and I describe them as follows:

Ochreous; head very hairy, the gray hairs of the front extending as far as the tips of the palpi, which are ochreous. Antennae white, with darker pectinations. Thorax pale ochreous; wings bright ochreous at base and along the outer margin; middle three-fourths of wing whitish-gray, especially toward the costa; a basal, brown, curved line, widening toward the costa; the extra-discal and outer diffuse line converging in the discal space, separating on the costa where they thicken; beyond, a broad, whitish, diffuse shade; near the apex a long whitish s. Margin bright ochreous, dusted like the whole wing with brown; fringe brown, with white between the points; secondaries pale, dull on the inner half, ochreous on the outer border; a mesial double line separating on the middle, then converging on the first subcostal nervule, and then

separating slightly on the costa; beyond paler, and a submarginal paler band; discal dot clear whitish. Beneath, whitish, with smoky strigæ; base and outer edge bright ochreous; the smoky diffuse bands distinct, the extradiscal one inclosing the bright, very distinct, white, lunate, discal dot, which is shaded externally with fuscous-ochreous, making a patch included between the two lines; a broad whitish band; the s reaches the middle point of the wing and connects with the broad whitish band; secondaries white on the costa and the inner margin, at the base between, bright ochreous, concolorous with the outer border; a broad, ferruginous, mesial band inclosing the lunate, silvery, discal spot; the line is bordered with whitish, and there is a second parallel interrupted line.

Length of body, 0.62; of fore wing, 0.86; expanse of wings, 1.85 inches.

Jamaica Plains, Mass. (W. Faxon); Mass. State Coll. (Sanborn); Pennsylvania (Clemens); Brooklyn, N. Y. (Graef).

EUGONIA Hübner. Plate 6, fig. 7.

Eugonia Hübner, (in part), Verz., 391, 1-18.

Ennomos Treits., Schm. Eur., vi (i), 3, 1-27.

Dup., Lep. France, vii (iv), 136, 1-29.

Geometra Steph. (in part), Nomencl. Br. Ins., 43, 1-29.

"*Odoptera* Soderf., Bull. Soc. Imp. Sc. Moscow, 16, 1-37."

Ennomos Boisd. (in part), Gen. Ind., 1-2, 1-10.

Dup., Cat., 218, 1-44.

Eugonia H.-Sch., Schm. Eur., iii, 40, 1-47.

Odoptera Steph. (in part), Cat. Br. Lep., 165, 1-50.

Eugonia Lederer, Verh. Bot. Zool. Ges. Wien, 175, 1-53.

Ennomos Guen., Phal., i, 173, 1-57.

Walk., List Lep. Het. Br. Mus., xx, 204, 1-60.

Body very stout and hairy or moderately stout. Head rather sunken in the body, squarish in front, with long hairs projecting more than usual in a tuft-like projection. Palpi stout and bushy, long, porrect, not ascending, extending well in front of the head; the third joint rather large, but partially concealed by the hairs of the second joint, or (*subsignaria*) long, slender, and quite free from the second joint, and as long as the latter joint is wide. Male antennæ very heavily pectinated to the tip, the branches stiff and regular; those of the female with pectinations as long as the antennæ are thick. Fore wings with the costa straight; the apex much rounded, very falcate; the outer edge deeply excavated and serrate below the apex; the angle on the first median venule is unusually large and rounded, below which the margin is again excavated and scalloped. Hind wings scalloped and

angulated in the same way. Venation: the costal region is very narrow; the costal vein anastomoses with the subcostal vein; there is no subcostal cell; the anterior discal venule is short and regularly curved, the posterior one very oblique. The hind tibiae are but slightly swollen, the tibiae large, long, and thick. Coloration: either deep ochreous, with the basal and extradiscal lines more or less obsolete, or white (*subsignaria*) and immaculate.

This genus is readily distinguished by the full, hairy, projecting front, the long, porrect palpi, the heavily-pectinated male antennae, those of the female being also pectinated, by the deeply-scalloped wings, and the hairy body.

Larva.—The body is rather thick; head large and round; a spine in the middle and near the end of the body; sometimes the body is thickest near the end of the body. Pupæ pale in color, situated between leaves.

Synopsis of the Species.

Pure white; wings entire.....*E. subsignaria*.
Ochreous-yellow; wings entire.....*E. alniaria*.

EUGONIA SUBSIGNARIA Packard. Plate 12, fig. 29; plate 13, fig. 1, larva.

Eudalimia subsignaria Hübn., Samml. Exot. Schm., ii, 1806.

Euonomos subsignaria Guen., Phal., i, 181, 1857.

Walk., List Lep. Het. Brit. Mus., xx, 209, 1860.

Geometra nicosocricaria Jones, Proc. Ent. Soc. Phil., i, 31, 1861.

Euonomos subsignaria Pack., Guide to Study of Insects, 324, fig. 248; pl. 8, fig. 6, larva, 1869.

4 ♂ and 2 ♀.—Wings entire in the male, in the female dentate. Entire body and legs uniformly snow-white. Antennae with white scales; pectinations testaceous.

Length of body, ♂, 0.60, ♀, 0.60; of fore wing, ♂, 0.60–72, ♀, 0.83; expanse of wings, 1.60–1.70 inches.

At once known by the snow-white body and wings, angulated fore wings, and notched hind wings.

London, Canada (Saunders); Northern Maine, August (Packard); Salem, Mass. (Emerton); Campton, N. H., August (Walker); Albany, N. Y. (Lintner and Meske); New York City (James Kimball); West Farms, N. Y. (Angus); "Nova Scotia" (Walker).

Larva.—The caterpillar closely resembles the twigs of the elm-trees, on the leaves of which it lives, the body being brown, while the large head and terminal segment of the body is bright red. A writer in the "Practical Entomologist" (vol. i, p. 57) states that the caterpillars are hatched as soon as

the leaves unfold, and live unobserved for a week or so in the young shoots in the tree-tops, and when half-grown are seen crawling about the tree. Toward the end of June they pupate, and in about a week after the moth appears. It is very destructive on the elm in New York and Philadelphia.

EUGONIA ALNIARIA Hübner. Plate 12, fig. 28; plate 13, fig. 1 *a*, pupa

Phalena-Geometra alniaria Linn., Syst. Nat., edit. x, 549, 1758; Faun. Suec., 834, 1746.

"*Geometra tiliaria* Borkh., Eur. Schm., v, 87, 1794."

Eugonia alniaria Hübner, Verz., 291, 1818.

Ennomos tiliaria Treits., Schm. Eur., vi (ii), 295, 1828.

Dup., Lep. France, vi (ix), 142, 1829.

Geometra alniaria Steph., Nomencl. Br. Ins., 43, 1829.

Steph., Ill., ii, 161, 1831.

Ennomos tiliaria and *alniaria* Boisdu., Gen. Ind., 183, 1840.

Dup., Cat., 219, 1844.

H. Sch., Schm. Eur., iii, 41, 1847.

Odoptera alniaria and *tiliaria* Steph., Cat. Br. Lep., 165, 1859.

Ennomos magnaria Guen., Phal., i, 174, 1857.

Ennomos alniaria Guen., Phal., i, 175, 1857.

Walk., List Lep. Het. Br. Mus., xx, 205, 1860.

Ennomos magnaria Walk., List Lep. Het. Br. Mus., xx, 209, 1860.

Delicate ocher-yellow, with a reddish tinge toward the edge of the wings, and on the head and front of the thorax. Fore wings with two lines, often interrupted, or only developed on the costa; inner line on the inner third of the wing; the curved outer line, beginning near the inner, diverges and follows a sinuate course, ending much nearer the apex than the inner line, the distance varying; both wings speckled, sometimes thickly, with unusually large spots; outer edge of both wings deeply excavated, especially opposite the second median venule. On the hind wings, no lines; an obscure discal dot centered with a short translucent line. Beneath, much as above, but no lines, except in one case a diffuse dark line crosses the hind wings. (The female differs in the usual characters of the dentated forms. Fringe dark, whitish in the notches on both wings.

Length of body, ♂, 0.80, ♀, 0.65; of fore wing, ♂, 0.90–1.08, ♀, 0.95–1.05; expanse of wings, 2.00–2.20 inches.

Northern Maine and Brunswick (Packard); Portland, Me. (Morse); Salem, Mass. (True and Emerton); Cambridge (Putnam); Albany, N. Y. (Lintner and Meske); West Farms, N. Y. (Angus); New Jersey (Sachs); Saint Louis, Mo. (Riley); Montreal and Nova Scotia (Walker).

The species varies considerably in the distance apart of the two lines on the fore wings, and in the degree of spotting. Our specimens do not apparently differ from European ones.

Regarding the early stages of this species, Mr. L. W. Goodell writes me as follows: "The caterpillar was taken at Amherst, Mass., on the chestnut, Aug. 20th; it was of a bluish-green color, with a thick wrinkle on each ring, those on the fifth and eighth thickest and light brown; on the back of the eleventh ring are two little warts tipped with brown. When fully grown it measured two inches and three-tenths of an inch in length, the body largest near the tail and tapering to the head. Aug. 21st, it drew a few leaves together, and spun a thin, silky, pear-shaped cocoon, became a chrysalis the 24th, and was transformed to a moth Sept. 13th. The chrysalis was one inch and two-tenths of an inch in length and bluish-white in color, ending in a flattened tail, tipped with black, and on each edge three small black spines, each ending with a minute hook." The pupa is represented on plate 13, fig. 1 *a*.

Feeds on the black birch; of the color of the twig, dull brownish-red, speckled considerably, and especially above, with dirty-white specks, arranged very frequently in lines, either longitudinal on the sides or curved forward above and becoming transverse. Head a little paler than the body; labrum and feet at base whitish. On the posterior portion of the fifth and eighth segments above, there is a transverse paler ridge bordered with black. Length two inches. It forms a cocoon by spinning in the midst of a bunch of leaves a close and firm cocoon of a bluntly fusiform shape, having a long neck extending above and below (it hangs perpendicularly) to the end of the many threads; open at both ends by an aperture about one-tenth of an inch in diameter.—(S. H. Scudder.)

Desiderata.

Eutomos concisaria Walk., List Lep. Het. Br. Mus., xxxv, 1551, 1866.—
 "Male. Pale yellow. Palpi stout, squamous, obliquely ascending, not rising higher than the vertex; third joint extremely minute. Antennae broadly pectinated nearly to the tips. Abdomen hardly extending beyond the hind wings; apical appendages rather large. Hind tibiae incrassated. Wings ample, with a broad antemedial dull ochraceous line, which is darker and more complete in the hind wings, and is still darker on the under side; a black point in the disk; a broad ferruginous marginal band, which includes an acute streak, the latter proceeding from the costa of the fore wings; the band bordered on the inner side beneath by a festooned blackish line. Fore wings sub-falcate, acute; a ferruginous basal patch, which does not extend to the costa;

exterior border very slightly bent in the middle. Hind wings with the exterior border dentate; the band beneath containing a yellow costal patch.

"Length of the body 10 lines; of the wings 24 lines.

"*a.* North America. From Mr. Carter's collection."

Eunomus lutearia Walk., List Lep. Het. Br. Mus., xxxv, 1552, 1866.—

"*Male.* Pale ochraceous, stout. Head and thorax densely pilose. Palpi porrect, pilose, moderately stout, extending a little beyond the head; third joint elongate-conical, hardly one-third of the length of the second. Antennae very slightly pectinated. Abdomen much shorter than the interior border of the hind wings. Legs rather short. Wings ample, thinly blackish-speckled, tinged with ferruginous along the exterior border; disk beneath with a small whitish blackish-bordered mark. Fore wings subfalcate, hardly acute; a blackish outward-curved line near the base; another blackish slightly outward-curved line, extending from four-fifths of the length of the costa to the interior border at somewhat before the middle of the latter; exterior border forming a prominent much rounded angle at rather in front of the middle. Hind wings with the exterior border dentate, the middle tooth much more prominent than the others; under side with a broad blackish antemedial line.

"Length of the body 8 lines; of the wings 30 lines.

"*a.* North America. From Mr. Carter's collection."

CABERODES Guenée. Plate 6, figs. 15, 16.

Endalimia Hübn. (in part), Verz., 286, 1818.

Caberodes Guen., Phal., i, 135, 1857.

Walk., List Lep. Het. Br. Mus., xx, 166, 1860.

Body rather slender. Head rather broad in front and short, being squarish. Palpi rather large and broad, slightly ascending, extending well in front of the head, though not so far as in *Eugonia*. Male antennae very broadly pectinated, the pectinations long and leaving the end simple. Wings very broad. Fore wings with the costa rather more convex than usual; the apex rectangular; outer edge regularly bent in the middle, neither excavated nor scalloped. Hind wings full and rounded, extending a little beyond the end of the abdomen. Venation: the costal region moderately broad; costal vein usually anastomosing with the subcostal (free in *cecinaria*); a long, narrow, subcostal cell (wanting in *cecinaria*). The discal veins are transverse, the lower one not oblique, regularly curved. Hind legs with the tibiae moder-

ately swollen; tarsi large, two-thirds as long as the tibiae. Coloration: ash-gray, with the extradiscal line straight, bent before reaching the costa. Discal spots distinct.

This genus differs from *Eugonia* or *Tetraxis* in the entire, broad, non-falcate wings, with the single bend in the middle, nearly obsolete in *cervinaria*, which is rather an aberrant species.

Synopsis of the Species.

Very small; fawn-color; line on the hind wings considerably curved..... *C. cervinaria*.
 Two oblique costal brown streaks between the basal and outer line..... *C. eugenaria*.
 Of large size; pale ochreous; extradiscal line straight..... *C. confusaria*.
 Still larger; pale ash-ochreous; extradiscal line shaded with dark externally..... *C. majoraria*.

CABERODES CERVINARIA Packard. Plate 12, fig. 34.

Caberodes cervinaria Pack., Fifth Rep. Peab. Acad. Sc., 81, 1873.

2 ♀.—Head and palpi ochreous, much lighter than the rest of the body. This belongs to a distinct section of the genus, the apex of the wings being acute, but the angle in the middle obsolete; otherwise the markings are as usual in the genus. Body and wings fawn-colored, being much darker than in any other species. Both wings uniformly fawn, with fine dark speckles. On fore wings between the two lines darker, with a large distinct discal dot, the two lines blackish, fine, the inner curved, especially toward the costa; in the other specimen much less curved. Outer line slightly oblique, less so than usual, ending on the costa farther from the apex than usual, in fact being just parallel to the outer edge of the wing; it is a little sinuate; the distance between the lines varies, the space being half as wide in some as in others. Fringe concolorous with the wings. Hind wings a little darker inside of the line than outside; the line is as on the fore wings and considerably curved. A very faint discal dot. Beneath uniformly fawn-ash, being lighter than above; the lines are obsolete, but the median shade on the fore wings faintly appears through, and the discal dots are small but distinct; the wings are regularly and finely speckled.

Length of body, ♀, 0.33; of fore wing, ♀, 0.50; expanse of wings, 1.00 inch.

Texas, May 8 (Belfrage).

It may be known by the fawn-colored wings, the median shade bounded by dark lines, and by the outer line ending on the costa much farther from the apex, and not bent back on the costa as usual in the genus. The venation of this peculiar species is represented on plate 6, fig. 16.

CABERODES CAYENNARIA Packard. Plate 11, fig. 53.

Apicia cayennaria Guen., Phal., i, 82, plate 5, figs. 2, 3, 1-57.

3 ♂ and 1 ♀.—Male antennae very heavily pectinated. Body and wings pale fawn-brown, much as in *C. confusaria*; head and thorax of the same color. Fore wings with a pale basal line edged externally, especially toward the costa, with brown; this line is firm, but bent at right angles in the middle of the wing. Discal dots on both wings minute, black. Just above the dot on the fore wings is a very oblique, brown, costal line, fading away below the subcostal vein. The extradiscal line is firm and even, bent acutely, sending its angle near the apex of the wing; above the angle is a dark costo-apical spot; the line is narrow, brown, shaded externally with whitish. The wing is paler between the discal dot and angle of this line than elsewhere. Beyond the line is a series of four or five smoky blotches, growing smaller toward the apex of the wing. Hind wings concolorous with the fore wings; but a single, faint, linear, brown line, shaded with whitish. Beneath marked with yellow, freckled with brown; hind wings a little paler. The lines are brown, but distinct; the extradiscal one forked on the apex of the fore wings; the wings beyond the extradiscal line are discolored with dull brown, or there is a series of large dusky patches instead, better marked toward the apex of the wing, but wanting in the single female.

Length of body, ♂, 0.55, ♀, 0.45; of fore wing, ♂, 0.62, ♀, 0.58; expanse of wings, 1.25 inches.

Dallas, Tex. (Boll); Texas, July 9 (Beltrage).

This well-marked species, from the unusual style of markings, might not be referred at first to this genus. The rectangularly-bent inner line, the oblique streak in the middle of the costa, and the yellow under side of both wings are sufficient to readily separate it from its congeners; in the female, the lines are deep brown, and the fore wings more acute and falcate than in the male.

This is certainly a *Caberodes*. It was labeled *Apicia cayennaria* by Professor Zeller, and does not seem to differ from Guenée's figure and description. Guenée's genus *Apicia* seems to me not to be well limited.

CABERODES CONFUSARIA Guenée. Plate 12, figs. 30, 31.

Eusarca confusaria Hübn. Exot. Schm., i, 1806.

Endelinia confusaria Hübn., Verz., 287, 1818.

Caberodes metrocampa Guen., Phal., i, 137, 1857.

Caberodes remissaria Guen., Phal., i, 137, 1857.

Caberodes imbraria Guen.!!!, Phal., i, 137, 1857.

Caberodes superaria Guen.!!!, Phal., i, 138, 1857.

Caberodes phasianaria Guen.!!!, Phal., i, 140, pl. 3, fig. 10, 1857.

Caberodes metrocampa Walk.!!!, List Lep. Het. Br. Mus., xx, 167, 1860.

Caberodes remissaria Walk.!!!, List Lep. Het. Br. Mus., xx, 168, 1860.

Caberodes imbraria Walk.!!!, List Lep. Het. Br. Mus., xx, 168, 1860.

Caberodes superaria Walk.!!!, List Lep. Het. Br. Mus., xx, 168, 1860.

Caberodes floridaria Walk.!!!, List Lep. Het. Br. Mus., xx, 169, 1860.

Caberodes confusaria Walk.!!!, List Lep. Het. Br. Mus., xx, 169, 1860.

Caberodes phasianaria Walk.!!!, List Lep. Het. Br. Mus., xx, 170, 1860.

Tetracis pandaria Walk.!!!, List Lep. Het. Br. Mus., xx, 173, 1860.

12 ♂ and 10 ♀.—Pale whitish-ochreous, rather thickly speckled with pale brown on the wings. Head, body, and wings concolorous. Fore wings with two lines varying in distance apart, the inner thread-like, brown, regularly curved, and slightly wavy, or bent on the costa and scarcely wavy (in one specimen the line is quite diffuse and deeply scalloped). Outer line brown, oblique, usually straight, and either obsolete before being bent on the costa, or bent at right angles on the costa. In two females is a row of three or four pale brown diffuse spots between the outer line and the margin of the wing. Discal dot on both wings. In one male the dot is immersed in the line on the hind wings, but usually on the hind wings it is just within the line. On the hind wings, the single line is more or less diffuse, varying with the same line on the fore wings in this respect. A slight sinus before the angle of the fore wings, the angle often well marked. Beneath, a little more ochreous than above, with thicker, darker specks, the lines faintly reproduced, the outer line sometimes bitid at the costa.

Length of body, ♂, 0.55–0.65, ♀, 0.50–0.60; fore wing, ♂, 0.65–0.75, ♀, 0.75–0.82; expanse of wings, 1.50–1.60 inches.

Montreal, Canada (Lyman and Caulfield); Brunswick, Me. (Packard); Boston, Mass. (Sanborn); Springfield, Mass. (Dimmock); Albany, N. Y. (Lintner); West Farms, N. Y. (Augus); Philadelphia, Pa. (Ent. Soc.); Virginia (Packard); Michigan (Niles); Detroit, Mich. (Mus. Comp. Zoöl.); Georgia (Grote); "Georgia" (Abbott, Guenée); Florida (Walker); Texas, May 22–25, September 20, October 1–24 (Belfrage).

A specimen from Maine is just like Hübnér's figs. 3, 4, ♀; the band bent back on to the costa, while usually the bend is wanting in the

female, as seen in his fig. 2 of the male. The inner line on the fore wing (♀) wanting in Hübner's figure is also wanting in some of my specimens.

This species varies considerably, one Texan specimen wanting the inner line, the outer common line being narrow, and the wings are not speckled. The most decided variation is an individual from New York (Lünter), in which the inner line is bent just below the costa, and below goes straight to the inner edge, ending nearer the outer line than usual, and the line is deeply scalloped. The common line is broad, and just beyond on the fore wing are three diffuse ochre-brown spots, concolorous with the lines.

It differs from the other species known to me by the paler colors, the lines sometimes not being edged with a paler tint, and the wings having a sharper apex in the female, and in being less densely speckled.

It is very common, widely distributed, and varies considerably, so as to give rise to museum species based on individual differences, but all variations of Hübner's original *confusaria*. The two most aberrant forms are those represented by figs. 30 and 31 of plate 12. Fig. 30 represents the normal form, but without the basal line on the fore wings, which, however, is usually present. Fig. 31 represents an example from Michigan, which has a series of dark marginal blotches, and is paler than the other form, without any light shade to the lines. This is like the figures of Hübner. I am inclined to think that Guenée's *C. ineffusaria* (p. 138) and *C. floridaria* (p. 139) are varieties of *confusaria*. In examining M. Guenée's type of *C. floridaria*, I regarded it as liable to prove a variety of *confusaria*. Guenée's description applies well to *confusaria*, except that he says the wings beneath are "washed with reddish". None of the specimens yet found are washed with any hue darker than a deep ochreous. He describes the larva of *floridaria* as being "grayish-white on the sides, of a rust-red on the back and beneath, these hues running together. There are neither lines nor points, and there are not more than two tubercles, which are situated on each side of the sixth ring. The head and feet are concolorous. It lives in March and April on a leguminous plant, which I cannot recognize from the drawing of Abbot, and which he names the 'Devil's shoestring'. The chrysalis is of a clear red, with extremity much pointed." While this description is based on Abbot's drawing of a larva found in Georgia, Guenée's type is from Pennsylvania. It may be found that it is the larva of *confusaria*, whatever may prove to be the fate of Guenée's species *floridaria*.

In one female, received from Mr. Grote and labeled "*C. remissaria* Walk. (*Tetracis pandaria* Walk.)", which had been compared by him with Walker's type, the wings are mottled coarsely with dark brown, and the lines are heavily shaded, particularly the extradiscal, on both wings, while the inner line on the fore wings is bent distinctly at right angles. It is evidently but a variety of *confusaria*.

Regarding the reduction of Walker's species to synonyms, I find I have arrived at the same conclusions as Messrs. Grote and Robinson. They say: "The specimens registered as ♂ *Caberodes imbraria*, p. 168, ♂ *C. superaria*, id., ♂ *C. ineffusaria*, p. 169, and ♂ *C. floridaria*, id., seem to us to belong all to *C. metrocamparia*, Guenée; ♀ *C. remissaria* is darker and maculate, but hardly seems distinct." They add that "*Tetracis pandaria* Walk. is evidently the ♀ of his *Caberodes remissaria*, which may thus be a distinct species".

CABERODES MAJORARIA Guenée. Plate 12, fig. 32.

Caberodes majoraria Guen., Phal., i, 138, 1857.

Walk., List Lep. Het. Brit. Mus., xx, 138, 1857.

2 ♂ and 1 ♀.—Body and wings pale ochreous, with an almost frosty appearance. Wings well angulated; on the hind wing a sinus just before the angle. Apex of fore wings pointed obtusely, but more prominent than usual. Wings more densely scaled than usual, being uniform on both wings. Fore wings with the inner line curved as usual, faint brown; outer line brown, oblique, very straight in its course to where it is reflected on to the costa, below which it is broadly and diffusely shaded with brown externally, thus differing from all the other species known to me. Hind wings with the line shaded as in the anterior pair, but only reaching as far as the discal space. Beneath, wings tinged with a warm yellow-ochreous tint, costa and fringe being yellowish, as well as the body, the legs, and also the veins. Both wings uniformly clouded with smoky specks, rounded, not transverse as in *C. effectaria*. Common line very distinct, dusky-brown, on the fore wings bent on the independent venule, on the hind wings well curved, sinuate, and extending on to the costa.

Length of body, ♂, 0.80, ♀, 0.80; of fore wing, ♂, 0.90, ♀, 0.90; expanse of wings, 1.90 inches.

Massachusetts, August (Packard and Minot); Salem, Mass., July 13 (Cassino); head of Plum Creek, Colo., June 29 (Lieutenant Carpenter, Hayden's Survey).

Well marked by the angular, pointed wings, by the common line being diffuse externally, and beneath forming a very distinct dusky line, reaching to the costa in both wings, and on the hind wings much more curved than in any other species.

Desiderata.

Caberodes interlinearia Guen., Phal., i, 140, 1857.—“35^{mm}. Elle se distingue de toutes les autres par une troisième ligne droite et oblique qui est placée à moitié entre les deux ordinaires des ailes supérieures. Au reste, l'extrabasilaire est elle-même droite et oblique, et la coudée est un peu flexueuse. L'angle des quatre ailes est assez bien marqué. New York. Deux ♂.”

Caberodes? varadaria Walk., List, xx, 251, 1860.—“*Male*. Testaceous. Palpi short, slender, porrect, extending very little beyond the head: third joint very minute. Antennae broadly pectinated. Hind tibiae slightly incrassated. Wings rather short with an exterior, nearly straight brown line, beyond which they have a somewhat darker hue; marginal points brown, elongated. Fore wings somewhat rounded at the tips; exterior border slightly convex, moderately oblique.

“Length of the body 4 lines; of the wings 8 lines. Georgia.”

Caberodes? agreasaria Walk., List, xx, 252, 1860, is = *Endropia duaria*.

DREPANODES Guenée. Plate 6, fig. 11.

Drepanodes Guen., Phal., i, 66, 1857.

Walk., List Lep. Het. Br. Mus., xx, 69, 1860.

Head rather narrow in front, nearly as much so as in *Eutrapela*, full, with the scales close. Palpi slenderer than in *Eutrapela*, porrect, not ascending, reaching a little beyond the front, the third joint small, button-shaped. Antennae heavily pectinated, the branches even, stout, extending to the tip. Fore wings more falcate than usual, the costa being unusually full toward the apex, which is more produced than usual. Outer edge sinuous, being excavated below the apex and full in the middle. Hind wings full and rounded, the outer edge very convex, neither bent nor sinuated; they reach slightly beyond the tip of the abdomen. Venation much as in *Eutrapela*, but the subcostal cell is open. The two genera differ from any preceding ones in the costal region being narrow, the free end of the costal vein being equal in length to the first, second, and third subcostal veins; apical area small. The fifth subcostal venule is rather short, while the discal venules are equal in length and

nearly equally curved. Hind legs with the tibiae very long, swollen; the tarsi one-half as long as the tibiae. Coloration: ochreous-brown, with a common outer line bent at right angles just before reaching the costa of the fore wings, but disappearing on the costa of the hind wings.

The species of this genus are much smaller than those of *Eutrapela*, and may be recognized by the very falcate fore wings, while the hind wings are rounded. The antennae are very heavily pectinated, the branches extending (though forming simply long tubercles) to the extreme tip. The hind legs are much as in *Eutrapela*, but the tarsi are a little longer. From *Caberodes* it differs in the falcate fore wings and more heavily pectinated antennae.

Larva and pupa.—Ramiform, the body provided with a number of tubercles, thus resembling the twigs of the tree on which it feeds. The head is no wider than the body, which increases in thickness toward the end of the body. Pupa of the usual conical form, rather thick.

Synopsis of the Species.

Fore wings more acute than in the others: dark, coarsely speckled.....*D. varus*.
Fawn-brown, with a light, common, extradiscal line.....*D. puber*.

DREPANODES VARUS Grote and Robinson. Plate 12, figs. 36, 37.

Drepanodes varus Grote and Robinson!!!, Ann. Lye. Nat. Hist. N. Y., viii, pl. 15 A, fig. 2, ♀, 1867.

Drepanodes aquosus Grote and Robinson!!!, Ann. Lye. Nat. Hist. N. Y., viii, pl. 15 A, fig. 3, ♀, 1867.

Drepanodes sesquilinea Grote!!!, Can. Ent. ii, 114, 1870.

Drepanodes juniperaria Pack., First Rep. Ins. Mass., 22, pl. 1, figs. 4, 5, 1871.

♂ —Antennae broadly pectinated; head, body, and wings uniformly clear ochreous, with scattered minute dark speckles; inner line deep ochreous, a little diffuse, curved irregularly, somewhat angulated opposite the discal dot, which it nearly touches, beyond which it curves straight on the costa; below the angle, it is regularly curved and sometimes sinuate. It is dark ochreous, paler without; the outer line is slightly curved inward, and toward the tip bent back at right angles on the costa, blackish externally, shaded broadly with dark ochraceous within. Between the two lines the wing is clear as usual. Discal dot black, small. Wing clear beyond the outer line. Toward the inner angle, there are three rounded, nebulous, dark spots, of which the middle one is the largest. Hind wings like the fore wings, with a single, broad, straight line; discal dot very distinct: a diffuse cloud, scarcely divided into distinct spots, near the angle; beyond the line, the strigae are sparingly scattered. Fringe with a reddish tinge. Beneath paler, especially on the secondaries. The common line faintly re-appears; slightly reddish on hind wings, and blackish on fore wings; discal dot very distinct, with scattered fine strigae.

These males are recognized readily by the three dark spots at the inner angle of the fore wing, and the dark lines, which are nearer the discal dot than in females. The above description was drawn up from the types of *sesquilinea*.

2 ♂ and 7 ♀.—Body dull ochreous, with a few black scales; antennae minutely annulated with black scales. Wings marked much alike; fore wings with two lines, the inner regularly curved, terminating on the costa at twice the distance from the base, as on the hind edge; the line is black, diffuse, with some subfuscous scales externally. Within are more numerous grayish scales. Within this line, toward the costa, are numerous black transverse scales. Discal spot distinct. Middle of the wing with a few transverse strigae, especially toward the costa, which is, however, not thus strigated. The outer line straight, black, terminating in the falcate apex of the wing, not being bent back on the costa as usual. Tip of the wing black; the outer line is margined broadly with gray spots; black and gray scales are numerous toward the inner angle of the wing, the anterior two-thirds of the outer edge of the wings being clear. Hind wings provided with a single straight extradiscal black line; within the discal dot are a few transverse strigae, while exteriorly the wing is dusky, and the scales are grouped into transverse clouds, situated half-way between the line and the outer edge of the wing. Outer edge rounded, scarcely angulated, clearer toward the costa. Body beneath, with the legs and wings, alike thickly strigated. The line common to both wings re-appears faintly; discal dots more distinct than above.

The female may at once be known by the much curved inner line of the fore wings, which is also deeply sinuate. (This line is sometimes obsolete.) The lines vary greatly in width, being broadest and darkest in the form of *rarus* figured by Messrs. Grote and Robinson. In other specimens of "*rarus*" from Alabama, received from Mr. Grote, the wings are clear and the lines fine. Grote and Robinson's type-specimen of *aquosus*, figured by them, is more densely and coarsely speckled than any of the others, the outer border of both wings being dull violaceous, mottled with blackish; but I have a specimen from Missouri which approaches this type-specimen closely. On the other hand, I have a specimen from Massachusetts (Stratton), which is intermediate between *juniperaria* and the Alabama *rarus*; the fore wing being strigated at the base and border of the wing, with a dark shade below the

middle of the border, due to dark scales crowded there. Beneath, the width and distinctness of the pale outer line varies, the black border of the line predominating in the type-specimens of Grote and Robinson, and appearing like a black line alone. Had I the original type-specimens of Grote and Robinson alone, I should probably, as they did, decide the two species to be distinct: but more material causes me at present to unite them.

From an examination of Grote and Robinson's types kindly sent me for examination, and with other specimens from different localities, I have been led to unite these four described species into one. My *juniperaria*, a single specimen, reared and in excellent preservation, is evidently intermediate between *varus* and *aquosus*.

Length of body, ♂, 0.45–0.50, ♀, 0.40–0.48; of fore wing, ♂, 0.50–0.57, ♀, 0.55–0.65; expanse of wings, 1.30 inches.

Brookline, Mass., September 20 (Shurtleff); Boston, Mass. (Sanborn); Natick, Mass. (Stratton); Newton, Mass. (Dr. G. F. Waters); Norwich, Conn. (S. H. Scudder); Albany, N. Y. (Meske); West Farms, N. Y. (Angus); New Jersey (Sachs); Alabama, West Virginia, and Pennsylvania (Grote); Easton, Pa. (Clemens).

A careful examination convinces me that the males which I had heretofore regarded as distinct from *varus* (labeled *sesquilinea* by Mr. Grote) are really the males of *D. varus*, of which heretofore we have only had the females. Two female *varus* are so light and free from dark blotches, and approach male *sesquilinea* so closely, that I am compelled to regard them as different sexes of the same species.

Larva.—The caterpillar of this species, var. *juniperaria*, is figured and briefly described on p. 43. The pupa is also figured on plate 13, figs. 30, 30 *a*.

DREPANODES PUBER Grote and Robinson. Plate 13, fig. 35.

Drepanodes puber Grote and Robinson, Ann. Lyc. Nat. Hist. N. Y., viii, pl. 15 A, fig. 1, ♂, 1867.

3 ♂ and 1 ♀.—Pale fawn color, the wings being unusually clear, and with very few black scales, except two black twin patches of them on the middle near the outer edge of the wing. Head, antennae, palpi, and body concolorous with the wings. Fore wing with two pale, almost whitish, lines, inner one a little less curved than usual, slightly sinuate below the median vein, and above not reaching very near the discal dot. Outer line bent back

as usual on the costa, not curved; posteriorly it forms a well defined pale line, shaded within with pale brown. The apex is clear, as the rest of the wing. A little below the middle, half-way between the outer line and the edge of the wing, are two twin, black, rounded patches. Fringe reddish brown, becoming blackish on the apex of each wing, and on the inner angle of the hind wings. Beneath, of same color as above, but thickly and transversely speckled: the outer line only present, forming a pale line. Discal dots distinct on both wings, which are a little tinged with dull violaceous on the apex and the inner angle. The female differs from the males in being darker fawn-color, with the pale lines narrower and less distinct, and more prominently edged with brown, while both wings are speckled beyond the outer line, and this part of the wing has a grayish tinge, as also the base of the wing inside of the inner line.

Length of the body, ♂, 0.50; of fore wing, ♂, 0.60, ♀, 0.63; expanse of wings, 1.25 inches.

It may be distinguished from all the other species by the pale lines, and by the two twin dots in the middle of the outer margin of the fore wings, while the wings are unusually free from scales. From *rarus*, ♂, it differs in the pale lines, clear hind wings, and is less ochreous.*

Boston, Mass. (Sanborn); Philadelphia, Pa. (Grote)

Desideratum.

Drepanodes olyzonaria Walk., List Lep. Het. Br. Mus., xx, 69, 1860.—
“*Female*. Reddish cinereous. Hind tibiae very slightly thickened. Wings

* *Drepanodes panamaria* Pack., Proc. Bost. Soc. Nat. Hist., xvi, 39, 1874.

2 ♂.—This species differs structurally in some important characters from the more northern species known to me. The wings are a little shorter, and the apex much less falcate than usual; the first subcostal interspace is much shorter and smaller than in *D. rarus* and *sesquilinea*, and all the venules sent off toward the outer edge of the wing are shorter than usual. The hind tibiae are greatly swollen, nearly twice as much so as in *D. sesquilinea*, and the spurs are much shorter. Antennae broadly pectinated, fully as much as usual. Body and wings pale yellow-ochreous, and of the same shade as above and beneath, including the legs. Fore wings with traces of a narrow, basal, curved, ferruginous line. An outer, oblique, pale-ferruginous line straight in its course (not curved as usual), just below the apex. On the costa, just in front of the angle, is a geminate black spot, and another spot on the apex. Another larger spot between the first and second median venules, and a large round black patch on the inner angle. Beyond the outer line, the wing is fawn-brown, and also the hind wings; the latter are crossed by a single, faint, narrow, ferruginous, straight line. Both wings have scattered black speckles. Beneath as above, except that there are no lines, but the brownish margins of both wings are as well marked as above. Minute discal dots above and below on both pairs of wings. Fore tibiae a little dusky.

Length of body, 0.45; of fore wings, 0.50; expanse of wings, 1.00 inches. Panama (Edwards).

It may be recognized, besides its singular structural features, by the edge of both wings being broadly shaded with pale fawn-brown.

This description of a Panama species of *Drepanodes* is appended, as the genus and possibly this species may yet occur in Southern California.

moderately broad, minutely black-speckled; line blackish, straight, distinct, ochraceous-bordered on the inner side, whitish-bordered on the outer side; discal point black, minute; fringe ochraceous. Fore wings falcate, excavated behind the tips, which are more speckled with black than the rest of the wing; interior line bent, almost obsolete except towards the costa; exterior border hardly convex. Length of the body 5? lines; of the wings 14 lines. East Florida."

This species is quite near *D. varus*, and may prove to be a variety of it, as I observed from an examination of Walker's type in the British Museum.

METANEMA Guenée. Plate 6, fig. 4.

Metanema Guen., Phal., i, 171, 1857.

Walk., List Lep. Het. Br. Mus., xx, 202, 1860.

Head much smaller, shorter than in *Tetracis* and *Eugonia*, with the front nearly square, narrowing slightly anteriorly. Palpi short, small, not extending beyond the front of the head. Male antennae well pectinated. Fore wings with the costa nearly straight, sinuous, falcate, the apex acute, prolonged, with more of an excavation beneath than in *Tetracis* or *Eugonia*, the angle in the middle of the edge being well pronounced. Hind wings with a large, prominent "tail" or angle, rather more pronounced than in *Tetracis*, with usually a slight tooth between the apex and the angle. Venation: two subcostal cells, the inner lozenge-shaped, the outer long and narrow; the anterior discal venule straight, the posterior oblique, slightly bent; otherwise the venation is as in *Tetracis* and *Eugonia*. Hind legs with the tibiae slightly enlarged; tarsi nearly as long as the tibiae. Coloration: lilac-gray or pale ochreous, with two nearly parallel lines on the fore wings and a single line on the posterior pair; sometimes a large reddish-brown discal spot on the fore wings.

The species may be separated from those of *Eugonia* and *Tetracis* by the small, short head and small palpi, scarcely extending beyond the front.

Synopsis of the Species.

Rather dark pearl-ash; fore wings darker between the two pale flesh-colored lines.....*M. carnaria*.
 Uniformly pearl ash, with two flesh-colored lines, and a very large, rich, reddish-brown
 discal spot.....*M. inatomaria*.
 Pale whitish-ochreous, with reddish speckles and lines; a third, submarginal, wavy, fine
 line.....*M. trilinearia*.

METANEMA CARNARIA Packard. Plate 12, fig. 33.

Cabrerodes carnaria Pack., Fifth Rep. Peab. Acad. Sci., 80, 1873.

2 ♂.—Ash-colored, darker than usual, with a salmon tint, especially

about the lines and on the under sides of the wings. Head reddish-brown in front and on the palpi, which are stout, and pass considerably beyond the front; the vertex is whitish ash. Wings salmon ash-gray, a little darker between the two lines; both lines pale, testaceous, edged on the sides facing the discal dot with brown; they are distinct, not blended with the rest of the wing; inner line oblique, slightly curved; the outer line is oblique, ending next to the apex; on the costa a broad pale space between the line and the dark apical streak below, the line being margined externally with a faint brown line; just beyond this line the wing is clear and paler, as within the inner line, and with dark flecks, but the edge of the wing is as dark as in the middle; discal dot black, small, curvilinear, distinct; fringe brown, with a paler line at the base. Hind wings a little paler and more transversely strigated than the fore wings; a single straight line just beyond the middle of the wing, like the outer line on the fore wings; beneath, paler than above, carneous-ash. Veins and common line with a decided reddish tint, especially toward the apex of the fore wings; the line is very diffuse, especially on the hind wings. Both pairs of wings are transversely strigated. Fringe brown beneath and darker on edge of fore wings. On the hind wings, the line is a very diffuse shade.

Length of body, ♂, 0.45; of fore wing, ♂, 0.50; expanse of wings, 1.00 inch.

Montreal, Canada (Caulfield); Lansing, Mich. (Miles); New York (Mus. Peab. Acad. Sc.)

METANEMA INATOMARIA Guenée. Plate 12, fig. 38.

Metanema inatomaria Guen., Phal., i, 171, pl. 3, fig. 7, 1857.

Walk., List Lep. Het. Br. Mus., xx, 203, 1860.

3 ♂ and 2 ♀.—Pale gray, with a slight salmon tint; wings specked transversely with brown, the specks being longest on the costa, there being two prominent, deep, brown, squarish spots just inside the terminations of the two lines. Wings crossed by two oblique pale lines, the inner situated just beyond the basal third of the wing; it is not sinuate, but is sometimes a little curved, and is bent a little on the costa, where it expands widely; outer line more oblique, shaded within with reddish-brown (especially on the hind wings), not curved, and not bent on the costa, but spreading to form a triangle it ends a little before the apex; just below the

apex is a brown patch, shaded with deeper brown within, and a little scalloped; discal dot unusually large, deep reddish-brown. Hind wings like the anterior pair, with one straight transverse line, shaded with brown on the inside and fading out on the costa; a small, obscure, discal dot. Fringe like the rest of the wing, with a pale line at the base. Beneath, a little paler than above, with a decided salmon tint; outer line bordered with a delicate salmon-red, on the costa filling up the space between the outer line and the apex; no discal dot on the fore wing, a distinct one on the hind wing. Wings more distinctly speckled beneath than above.

Length of body, ♂, 0.40,–0.47, ♀, 0.55; of fore wing, ♂, 0.55, ♀, 0.67; expanse of wings, 1.40 inches.

Montreal, Canada (Caulfield); Brunswick, Me. (Packard); New Hampshire (Walker); Cambridge, Mass. (Harris Coll.); Albany, N. Y. (Lintner); Brooklyn, N. Y. (Graef); New Jersey (Sachs); Wisconsin (Hoy); Saint Louis, Mo. (Riley); Glencoe (Nebraska).

METANEMA QUERCIVORARIA Guenée. Plate 12, fig. 39.

"*Phalena quercivoraria* Abbot, MS." Guenée.

Metanema quercivoraria Guen., Phal., i, 172, 1857.

Walk., List Lep. Het. Br. Mus., xx, 203, 1860.

Body and wings pale whitish-ash. Wings thickly covered with fine speckles. Fore wings with three lines, the usual inner and outer line, and a third wavy submarginal hair-line. The two inner lines distinct, of even width, a little oblique, not waved; the innermost line situated exactly on the inner third, the outer line on the outer third of the wing. Costa stained with reddish on the end of the outer line. Submarginal hair-line wavy, sinuate, reddish, situated half-way between the outer line and the edge of the wing, and disappearing below the second median venule, scalloped between each venule, much more distinct below than above. On the hind wings, a single brown line, and traces of a submarginal wavy line. Beneath, paler than above, with the lines reproduced beneath, and dull-colored; the third submarginal line on both wings partially obsolete, but clearer than above. Fringe reddish.

Length of body, ♂, 0.45; of fore wing, ♂, 0.73; expanse of wings, 1.50 inches.

Eastport, Me., July (Packard); New York (Grote); Central Missouri, August (Riley).

This species may be known by the angular falcate fore wings, with the light reddish brown lines on the pale ash-speckled wings, and by the dentate hind wings, with the single clear line and submarginal abbreviated line, as well as by the short small palpi and elongated hind wings projecting farther than usual beyond the body. This species is allied to *M. albaria* Walk. from Florida, which may prove to be a variety of the present species.

This agrees well with Guenée's description, except that the edge of both wings are clear in all my specimens.

Larva.—Caterpillar of a very pale green, with the sutures and sides reddish, a double angle (*arête*) bordered with reddish on the second ridge, another more salient on the sixth, and finally another on the tenth; the fifth has on each side a small pointed tubercle. Head and feet concolorous. It lives on the oak and poplar, in April; it pupates at the beginning of May, and the moth appears at the end of the same month. The chrysalis is of a gray-brownish, with the abdominal incisions reddish."—(Guenée's description from Abbot's MS. drawings.)

Desiderata.

Metanema forficaria Guen., Phal., i, 172, 1857.—"40^{mm}. Ailes supérieures à apex très-aigu et falqué, à bord terminal ondulé, avec le coudé de la 2 plus obtus que chez les autres espèces, d'un testacé clair, avec quelques écailles noires parsemées, et la frange plus foncée. Deux fines lignes ondulées à la place ordinaire, claires, liserées de brun, et dont la seconde va rejoindre l'apex qui est marqué de gris noir. Ailes inférieures subdentées, avec la dent de la 2 plus saillante, mais arrondie, plus claires que les supérieures, avec une ligne faible continuant la coudé. Un point cellulaire noir aux quatre ailes. Californie."

Metanema albaria Walk., List Lep. Het. Br. Mus., xx, 260, 1860.—"*Femate*. Pale testaceous, whitish testaceous on the under side. Front flat. Palpi slender, very short. Antennæ rather stout. Legs stout; hind tibiae not incrassated. Wings indistinctly ochraceous speckled, slightly black speckled exteriorly; a brown oblique nearly straight line, reddish bordered on the outer side; a more exterior undulating and denticulated line, which is most apparent on the under side; a black discal point. Fore wings sub-falcate; exterior border concave on each side of its very distinct angle; a nearly straight and upright interior line which is dilated on the costa; a

patch of black speckles near the interior angle. Hind wings extending a little behind the abdomen; exterior border slightly denticulated, with a very prominent angle in the middle. Length of the body 5 lines; of the wings 16 lines. East Florida."

TETRACIS Guenée. Plate 5, fig. 18; plate 6, fig. 2.

Tetraxis Guen., Phal., i, 140, 1857.

Walk., List Lep. Het. Br. Mus., xx, 172, 1860.

Head large, prominent, full in front, moderately broad, narrowing a little anteriorly. Palpi thick, either short, not passing much beyond the front, or large, acute, and extending beyond the front by a distance nearly equaling the width of the front of the head. Male antennæ either simple and thickened, or with short pectinations. Thorax moderately stout and hairy, not so pilose and thick as in *Eumomos*. Fore wings with the costa usually quite straight and slightly sinuous, distinctly falcate, the apex produced, acute or subacute; the outer edge excavated more or less below the apex, and with a very prominent median angle, much larger in the female than in the male. Hind wings usually large, extending beyond the end of the abdomen, well rounded on the apex, with a large acute tooth or angle in the middle; sometimes the angle in the males is nearly wanting. Venation: the costal area is very narrow, and the free end of the costal vein and the first three subcostal venules short, one short (*crocallata*), sometimes (*truxaliata*) a rather long and narrow cell. The discal venules vary in the anterior one being straight and curved inward; the posterior one is usually oblique, directed outward. The hind tibiæ in the male are either moderately or considerably swollen, the tarsi nearly as long or three-fourths as long as the tibiæ. Abdomen usually long and slender in the male. Coloration: either cream-white or yellow, with a single oblique brown line on the fore wings, or yellow with brown bands, or of different shades of ochreous, with dark lines and thickly speckled.

From the material before me, I have been unable to perceive any essential difference between *Tetraxis* and *Eugonia*; they run into each other insensibly. The species differ from those of *Eugonia* in the less heavily-pectinated male antennæ, the less pilose thorax, the shorter palpi, and in the wings not being dentate, though those of ♂ *E. subsignaria* are not so. From *Eutrapela* they differ in the wings being narrower and much more angular and

falcate; while the antennæ are nearly always pectinated. It is possible that the species may intergrade with those of *Eugonia*. The distinctions are certainly somewhat artificial. The genus is principally restricted to the Pacific coast, the less typical forms (*lorata* and *corallata*) being restricted to the Atlantic coast. These two species are in many respects closely allied to *T. trianguliferaria* of the Pacific coast, so much so as not to warrant their generic separation.

Synopsis of the Species.

A. Male antennæ simple; wings slightly angular:

Cream-white, with a single ochreous oblique line on the fore wings *T. lorata*.

Yellow, with a single brown oblique line on the fore wings *T. corallata*.

B. Male antennæ pectinated; wings of male rounded, in female very angular:

Deep yellow, with three very large, brown, costal spots; antennæ narrowly pectinated, *T. trianguliferaria*.

Whitish-yellow; fore wings with two broad dark lines; antennæ plumose *T. coloradaria*.

C. Palpi long; the species of various shades of brown:

Fawn-brown; fore wings with two pale subparallel lines *T. parallellaria*.

Dull orange; fore wings with the inner lines curved outward; the outer more or less sinuous, *T. aurantiacaria*.

Fawn-brown; larger than any of the preceding species; wings broad and well angulated, *T. coccinaria*.

Pale ochreous; wings very falcate, with a slight angle between the apex and the middle angle; a single, broad, outer, sinuous line, curved outward before reaching the costa *T. groharia*.

The largest of all the species, the wings very falcate and angular, pale ochreous, the anterior pair with three blackish subparallel broad lines; male antennæ simple, *T. tricolorata*.

Wings much less falcate and angular than in the other species of section C; fore wings with two black scalloped lines; hind wings with a single scalloped line; male antennæ simple *T. agrotata*.

TETRACIS LORATA Grote. Plate 12, fig. 41.

Tetracis lorata Grote!!!, Can. Ent.

4 ♂ and 2 ♀.—Body and wings uniformly cream-white. Palpi and under side of the antennæ ochreous. Wings unspotted, with a single, dull, ochreous, oblique, straight line extending from just beyond the middle of the inner edge to the costa, ending just before the apex; hind wings with no line, immaculate. No discal dots on either wings. Beneath immaculate, the band not re-appearing on the fore wing.

Length of body, ♂, 0.60, ♀, 0.60; of fore wing, ♂, 0.85, ♀, ?; expanse of wings, 1.75 inches.

In one male from Albany, N. Y. (Lintner), the front is dull ochreous, this shade running up the orbits.

East Falmouth, Mass., June 4 (W. C. Fish); West Farms, N. Y. (Angus).

It differs from *T. crocallata* by the cream-white wings, the dull-ochreous line on the fore wing, while the apex of the fore wing is not so pointed as in *T. crocallata* or *aspilates*, and there is no line reproduced beneath, and no traces of a discal dot beneath. The hind wings are much more obtuse than in *T. crocallata*.

Maine (Packard); Albany, N. Y. (Lintner); Philadelphia, Pa. (Grote); Iowa (Parker); Saint Louis, Mo. (Riley).

TETRACIS CROCALLATA Guenée. Plate 12, fig. 40.

Tetracis crocallata Guen., Phal., i, 141, 1857.

Walk., List Lep. Het. Br. Mus., xx, 172, 1860.

Tetracis aspilata Guen., Phal., i, 141, 1857.

Walk., List Lep. Het. Br. Mus., xx, 173, 1860.

6 ♂ and 6 ♀.—Body and wings uniformly bright ocher-yellow; wings slightly speckled with brown. A broad, oblique, coffee-brown band on the fore wings, extending from just beyond the middle of the outer edge to the apex; discal dot not large, but prominent on both wings. On the hind wings, a single straight line, not reaching the costa (in three out of twelve specimens the line is entirely wanting on the hind wings). Beneath as above; the line most distinct toward the apex; the female paler and with a narrower line on the fore wings than the male.

Length of body, ♂, 0.65, ♀, 0.60; of fore wing, ♂, 0.58–0.83, ♀, 0.80–0.85; expanse of wings, 1.75 inches.

Montreal, Canada (Lyman); Brunswick, Me., June (Packard); Massachusetts (Sauborn and Emerton); West Farms, N. Y. (Angus); Albany, N. Y. (Lintner and Meske); Philadelphia, Pa. (Grote); Lawrence, Kans. (Snow).

It varies in the presence or absence of the line on the hind wings; in three out of nine specimens, the band on the fore wing is very broad, three times as much so as in others. In a female from Iowa (Parker), with the line present on both wings, the wings are speckled much more than usual. I found on examination of Guenée's types that his *T. aspilata* is a pale variety of his *crocallata*, without the band on the hind wings.

Larva.—"From two females confined in a box, I obtained on June 18th–20th over three hundred eggs. These are subovate, slightly flattened at the

larger end, varnished. From fifteen to forty eggs are laid at a time, during the night only; they are deposited about one hundred in one spot, in curving sometimes angulated rows, which have the appearance somewhat of radiating from a common centre. When first laid they were yellowish-green; on the 20th they had become ochro-olivaceous; on the 21st indian red, and by the 28th or 29th the greater part appeared gray, which effect was caused by innumerable minute black atoms on a whitish ground. On the 31st they were all a deep though rather dull purple. Hatched on the 30th and 31st. Some of the larvæ lived until July 7th. Head several times larger than the prothorax, ochraceous, luteous, sub-globose; anal segment much enlarged, white; prolegs, two pairs, white. The enormous head and anal segments gave these caterpillars the appearance of minute, animated dumb bells. Above, fuliginous; stigmatal line, white; beneath, pale red. They were very active, almost constantly in motion. Each time before looping, it rears itself up on its hind legs, and turns round in every direction, as if scrutinizing the neighborhood. I tried in vain to rear them, experimenting with almost every food plant I could think of."—(C. S. Minot, Can. Ent., ii, 28.)

Pupa.—Of the usual shape, with the anal spine large and acute. Gray, spotted and speckled with reddish-brown. A double row of dorsal spots. Head and thorax dark brown; wings spotted like the rest of the body. Length, 0.62 inch. "From a dark geometric larva found feeding on the sumach in the spring. Imago late in May."—(Saunders.)

TETRACIS TRIANGULIFERATA Packard. Plate 13, fig. 60.

Tetracis trianguliferata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 384, 1871.

1 ♂ and 1 ♀.—This species belongs to a distinct section of the genus from the preceding, as the male antennæ are pectinated, the palpi are remarkably long, and the venation is different. It differs from *T. lorata* and *crocallata* in the head being a little smaller, and the front slightly narrower, while the antennæ are well pectinated, the pectinations being slender and rather long. The palpi are moderately long, ascending and reaching a little beyond the front, and usually pointed. The hind femur is slender, not swollen much; the costa is much wider, so that the subcostal venules are shorter and thrown off at a much greater angle; the lozenge-shaped subcostal cell is small, one-half smaller than in *crocallata*, and there are other slight differences, the venation of *T. crocallata* and *lorata* being almost identical. The wings

are a little narrower, much more angulated, and the markings are different. It is bright ochreous-yellow, both wings dotted over with scattered brown specks. Orbits and tips of palpi speckled with light brown. Three large brown spots edged with dark brown on the costa, the basal one next the thorax not extending below the subcostal vein, and nearly twice as long as broad, the second just within the middle of the wing, equilaterally triangular, the apex blunt and resting on the median vein; the third is nearer the apex than the second spot, and is equilaterally triangular, with the apex acute and resting on the independent venule. Between these two last spots are three small costal spots. A short brown band runs from the outer third of the middle edge to the third median vein. A minute discal dot. Fringe concolorous with the rest of the wing. Hind wings with a large tooth: a large tooth in the middle of the fore wing. Hind wings slightly paler on inner half, no markings. Beneath, the large triangular spots are faintly reproduced, and the brown speckles are long and larger than above. The fringe is yellow, with a brown line at the base.

Length of body, ♂, 0.55; of fore wing, ♂, 0.76; expanse of wings, 1.60 inches.

California (Behrens); Sierra Nevada, Cal. (Edwards).

TETRACIS COLORADARIA Packard. Plate 12, fig. 47.

Eumomos coloradaria Grote!!!, Ann. Lye. Nat. Hist. N. Y., viii, pl. 16, fig. 11, ♀, 1867.

1 ♂ and 1 ♀.—In the male, the fore wings are long and but slightly bent on the outer edge, while the hind wings are also only moderately angular; while in the female both wings have a large, prominent, median angle. Male antennae with long pectinations, subplumose. Front of head smooth, not pilose. Palpi large and long, pointed, extending well in front of the head. Body and wings pale yellow. Fore wings with two unusually broad black bands (rather than lines), the inner curved outward and rather flexuous, the outer oblique, flexuous, and bent on the costa; it is edged internally with deeper black scales, the inner line edged externally in a similar way. Hind wings with a single, very flexuous, extradiscal line. Discal dots on both wings, which are sprinkled over with dark speckles. Beneath, the wings are concolorous with the upper side, and the bands on the fore wings faintly re-appear, while the single line on the hind wings is nearly as well marked as on the upper side.

Length of body, ♂, 0.60, ♀ : of fore wing, ♂, 0.75, ♀, 0.75 : expanse of wings, 1.50 inches.

Coloradô (Grote and Sachs).

This is a well-marked species and need not be confounded with any other. It is not an *Eugonia* unless the species of *Tetraxis* should all be placed in that genus, as the head and thorax are closely scaled. It may be distinguished from the other species by its pale-yellow hue and the two black conspicuous bands on the fore wings.

TETRACIS PARALLELLARIA Packard. Plate 12, figs. 42, 43.

Tetraxis parallellaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 38, 1874.

1 ♂ and 5 ♀.—Male antennæ with long, slender, those of the female with short, pectinations. Palpi large and long, extending farther beyond the front of the head than in any of the preceding species; fore wings falcate and angulated in both sexes, while the hind wings have a rather small "tail" or angle not less marked in the male than in the female. Fawn-brown: palpi as dark as the fore wings, which are rather darker than the body and hind wings. The fore wings are uniformly fawn-brown, with two nearly parallel brown lines edged with paler scales. The inner line is oblique, bent slightly below the costa, but straight for the remaining distance: it is situated rather nearer the middle of the wing than usual. Outer line oblique, slightly flexuous, curved inward slightly in the middle. Fringe of a little darker hue than the wing. Hind wings paler than the anterior pair, mottled faintly with pale-brown scales: on the under side the spots are more distinct. The discal dots are more distinct beneath than above. On the fore wings the tint is uniform, and the lines are only faintly reproduced.

Length of body, ♂, 0.50, ♀, 0.60; of fore wing, ♂, 0.60, ♀, 0.60–0.85; expanse of wings, 1.20–1.60 inches.

Sierra Nevada, Cal. (Edwards): Sanzálito, Cal., April 24, October 8 (Behrens).

In this species, the inner line of the fore wings is straight, neither curved nor flexuous, and the angle in the hind wings is slight compared with that of *T. cervinaria*, and it is smaller than in *T. aurantiacaria*, while the female antennæ are pectinated.

TETRACIS AURANTACARIA Packard. Plate 12, figs. 44, 45.

Metarna aurantiacaria Pack., Proc. Bost. Soc. Nat. Hist., xvi, 34, 1874.

2 ♂ and 5 ♀.—Body ochreous: wings orange-ochreous, sometimes deep

reddish-ochreous. Palpi long and slender, passing as far beyond the front as the head is wide; black in the outer half above. Fore wings orange-ochreous; inner line black, regularly curved; outer line oblique, more sinuous than usual (in one case, fig. 44, straight), not bent on the costa; it is brick-red in color, shaded inside toward the middle of the wing with deep ferruginous orange; sometimes narrow and blackish, edged externally with ochreous. Usually no markings on the edge of the wing, but in one very dark example a dark diffuse wavy line, edged with light reddish ochreous beyond, extending to the edge of the wing. A single line on hind wings, straight, not reaching the costa, and of the same color as that on the front wings. This line varies in color, being in one case black, sinuous, reaching the costal edge, and interrupted in the middle, nearly opposite the discal dot; sometimes the line is entirely wanting. Four discal dots. Beneath, the wings are of the same color as above, but a little clearer yellow, and the lines faintly re-appear, that on the fore wings being a little curved, while in one example there is a broad dark band just beyond the extradiscal line. This species belongs to the same section of the genus as *T. cervinaria*, and is a little smaller, with the apex and angles of the wing more acute; behind the angles, the wings are entire. The moth is quite different from Guenée's *M. forficaria*, which does not yet seem to occur in American collections.

Length of body, 0.60; of fore wing, 0.77; expanse of wings, 1.60 inches.

Nevada (Edwards): Sanzálito, Cal., October 10, November 8-11 (Behrens).

It may be recognized by the acutely-angled wings, the ferruginous or blackish undulating extradiscal line, the deep orange-ocher of the wings, and the blackish palpi.

One female from Sanzálito, Cal., is fawn-brown, and might be mistaken for *T. paralleliaria*, but has simple antennæ, and the inner line on the fore wings is curved as usual.

TETRACIS CERVINARIA Packard. Plate 12, fig. 46.

Metanema cervinaria Pack., Proc. Bost. Soc. Nat. Hist., xiii, 386, 1871.

2 3.—Differs structurally from the other species described by Guenée in the antennæ not being pectinated, but finely ciliated beneath, while the palpi are rather large and stout, passing a little beyond the front. The body

and wings are of a uniform fawn-color, the scales being thick and close. The basal line is angulated on the median vein, extending thence straight to the costa, and below the median vein its course to the inner edge is oblique and slightly sinuous. The outer line pale testaceous, like the inner, but a little more distinct, and slightly sinuous; it is situated half-way from the inner line to the outer edge of the wing. Apex very acute, median angle large, as is that on the hind wings. A minute black discal dot on both wings. On the hind wings, the single straight pale line is a little broader than on the fore wings. Fringe short, testaceous, a little reddish at base, especially toward the angles. Abdomen a little paler than the thorax. Beneath, the wing is pale ochreous, with dense black strigæ, often confluent; both wings are shaded with a slight ashen tinge on the outer edge; on the fore wings, the strigæ unite in diffuse patches, forming an irregular broad band on the outer third of the wing; fringe as above.

Length of fore wing, 0.87; of body, 0.72; expanse of wings, 1.50 inches.

W. Springs, Cal. (Behrens).

Another individual from California, taken by Mr. Behrens October 16, is ochreous, with the fawny-brown lines and the inner line on the fore wings much curved.

This fine species may be recognized by its large size, uniform fawn-color, the simple antennæ, and the two testaceous lines on the fore wings, the inner line being curved regularly.

TETRACIS GROTEARIA, *sp. nov.* Plate 12, fig. 48.

1 ♂.—Head smooth in front. Palpi large, extending far beyond the front of the head. Antennæ with moderately long pectinations. Fore wings with the costa sinuous, falcate, the outer edge not excavated as much as usual, with a slight projection half-way between the apex and the median angle, the latter not so prominent as usual. The angle on the hind wings is well marked, much as in *T. truxaliata*. Body and wings pale ochreous. Fore wings with the inner line broad, diffuse, curved outward, not well marked; the outer line scalloped, sinuous, curved outward beneath the costa; the line is made up of a fine black line, with the shallow scallops filled in with white scales, with a broad brown shade beyond. Hind wings with traces of a straight dusky line; both wings speckled transversely with

brown. Beneath, slightly paler than above, with a single, oblique, dusky, extradiscal line; no line on the hind wings. Abdomen wanting.

Length of fore wing, ♂, 0.70; expanse of wings, 1.50 inches.

Garden of the Gods, Manitou, Colo., July 13 (Packard, Hayden's Survey).

In this species, the fore wings are more blunt at the apex than in some of the allied forms; but it is, on the whole, more nearly related to *T. truxaliata* than the others, though it differs in the antennæ being well pectinated and in the fore wings being subdentate between the apex and median angle.

TETRACIS TRUXALIATA Guenée. Plate 13, figs. 59, 67.

Tetracis truxaliata Guen., Phal., i, 112, 1857.

Walk., List Lep. Het. Br. Mus., xx, 173, 1860.

5 ♂ and 5 ♀.—Male antennæ simple. Palpi large and stout, extending far beyond the front of the head. Wings very angular, of nearly the same form in both sexes, being very falcate, the apex very sharp; the outer edge well excavated below the apex; the median angle large and very prominent. Hind wings with a large, well-marked angle, or "tail", a little more prominent in the male than the female. Body and wings bright ochreous; the hind wings a little clearer and paler. Fore wings with three black bands, enlarged on the veins, and, where partly obsolete, represented by venular spots; the two inner lines are wide apart; the basal is curved outward, especially below the costa; the extradiscal line is sinuous, while the submarginal (which is narrower than the other two) is bent outward opposite the median angle; discal dots black, well marked on both wings. Hind wings either clear or with a few strigæ, and traces of an extradiscal line; beneath, clear, uniformly ochreous, and no paler than above, while on the fore wings the three lines are quite distinct.

Length of body, ♂, 0.60–0.80, ♀, 0.65–0.85; of fore wing, ♂, 0.70–0.95, ♀, 0.80–0.95; expanse of wings, 1.80–2.00 inches.

California (Edwards): Sanzálito, Cal., June 5–7, September 9, October 2–7 (Behrens).

This species differs from those allied to it in the antennæ being simple in the male, and in the three broad, dark lines, sometimes tinged with ferruginous. It is the most abundant species in California. It varies a good deal (as do all the species as seen in collections) in the distinctness of the lines; sometimes the ochreous tint of the fore wings especially is quite deep-toned, approaching a rust-red hue.

TETRACIS AEGROTATA Guenée. Plate 13, fig. 65.

Tetracis aegrotata Guen., Phal., i, 141, 1857.

Walk., List Lep. Het. Br. Mus., xx, 173, 1860.

Charodes aegrotata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 382, 1871.

8 ♂ and 2 ♀.—The wings are less falcate than in *T. truxaliata*, and the median angle of both wings is slight, but with a slight tooth between the apex and central large tooth, while the wings are without the usual well-defined angulated line on their outer third, and the male antennae are simple. Body and wings of a uniform pale light fawn-color; wings almost white beneath. Head with thick hairs on the vertex, the scales being longer than usual; just below the antennae, a dark-brown band; below a little paler than the vertex. Palpi tipped with brown. Antennae concolorous with the rest of the body. Wings densely speckled with brown; an inner, curved, very slightly dusky line, with five or six black venular dots, and a similar line going from just beyond the middle of the hinder edge, following a sinuous course to the costa near the apex, with a black dot on each venule. A few minute black dots on the base of the fringe, which is concolorous with the rest of the wing. A slight discal dot on both wings, that on the fore wings small but diffuse, that on the hind wings a minute black dot. Hind wings the same as the anterior pair, the speckles being arranged in a faint band, straight, crossing the middle of the wing; an outer curved row of black dots parallel to the outer edge. Beneath, dull white; costa and antennae, half of the fore wings, together with the costa and the outer half of the hind wings sprinkled with black scales, and a row of dots parallel to the outer edge of the wing near the edge; discal dots as above, but larger and much more distinct. Fore legs dusky in front; tarsi of hind and middle legs dusky; otherwise white.

Length of body, ♂, 0.65, ♀, 0.80; of fore wing, ♂, 0.83, ♀, 0.95; expanse of wings 1.70–2.00 inches.

Sanzalito, Cal. (Behrens); Mendocino City, San Mateo, Cal. (A. Agassiz, Mus. Comp. Zoöl.).

This common species varies in the tint of the wings, and the outer line of dots varies in distinctness and degree of sinuosity. In one specimen, the outer band on the fore wings divides into two; the inner, opposite the discal dot, being a broad, wavy band, situated half-way between the dot and the outer band.

Several specimens received from Mr. Behrens show that this species

varies considerably in the degree of distinctness of the broad, often very distinct, dusky cloud on the inside of the outer row of dots, the inner edge often being straight and crossing the middle of the wing, while both pairs of wings, in some examples, are much darker than in others. The lines and the dusky borders are more conspicuous, the inner and outer lines farther apart, and the inner line more curved in the male. The wings of this sex are paler, the speckles being less numerous. The wings of the female also vary.

One male from Mr. Behrens differs in being of a deeper fawn-color, with the two lines on the fore wings and single outer line on the hind wings, forming very distinct, dentate, black lines, and the two on the fore wings much nearer together than usual; discal dot obscure, and the inner line on the fore wings less curved than in other male specimens. It is a little smaller in size. Beneath, the same, but the lines more distinct. I retract my former remark that this species was "wrongly referred to the genus *Tetracis* by Guenée"; for, while in the characters of the head and antennae it is nearly allied to *Eutrapela*, still the wings have the shape of those of *Tetracis*, and it should be retained where Guenée placed it. It differs from any species of *Eutrapela* in the shorter hind wings.

This is probably a species of Guenée's genus *Sabulodes*, and near *S. caberata*, but I allow it to remain where it is provisionally.

Tetracis pandaria Walk., List, xx, 173, is a large rubbed *Caberodes metrocamparia*!, as I learned by an examination of Walker's type in the British Museum.

EUTRAPELA Hübner. Plate 6, fig. 18.

Eutrapela Hübner, Samml. Exot. Schm., i, 1806.

Eugonia Hübner (in part), Verz., 291, 1818.

Chorodes Guen., Phal., i, 35, 1857.

Walk., List Lep. Het. Br. Mus., xx, 14, 1860.

Head narrower in front than usual, slightly more so than in *Drepanodes*, the scales very close. Palpi large, stout, slightly ascending, extending well in front of the head, the third joint a little longer than in *Drepanodes*. Antennae in the male simple, compressed, ciliated; in the female simple. Fore wings distinctly falcate, the costal edge regularly convex, the apex suddenly acute, especially in the females. Outer edge with a well-marked angle; the edge in both wings is entire in *E. transversata*, slightly scalloped

in *E. clemataria*, especially in the female. Hind wings large, with a prominent angle on the first median venule, even with the tip of the abdomen. Venation as in *Drepanodes*, but a subcostal cell present, and the discal venules are not curved as in *Drepanodes*. Hind legs with the tibiae very long and swollen, with a fan-like tuft of hairs on the inner edge, often folded up and not visible; tarsi about one-third as long as the tibiae. Abdomen long and slender. Coloration much as in *Drepanodes*.

The simple ciliated male antennae, falcate fore wings, the prominent angle in the hind wings, and the large, swollen, tufted hind tibiae, as well as the narrow front of the head, are the distinguishing marks of this easily recognizable genus. In the narrow front of the head and the simple antennae, this genus approaches *Urania* more closely than any other phalaenid moth.

Larva.—Ramiform, variously tuberculated, with the third thoracic segment either tuberculated or swollen; the body rather thick; head not wider than the body. Pupæ pale brown, mottled with red, or quite uniformly reddish-brown.—(Described from Abbot's MS. drawings.)

Synopsis of the Species.

Whitish-ochreous, with three subapical black spots.....	<i>E. falcata</i> .
Fawn-colored, both lines bent outward near the inner edge.....	<i>E. nubilata</i> .
A costo-apical, triangular spot; the line on the hind wings much bent.....	<i>E. forciferata</i> .
Outer edge of the wings entire; wings clear.....	<i>E. transversata</i> .
Outer edge of the wings slightly scalloped; wings mottled.....	<i>E. clemataria</i> .

EUTRAPELA FALCATA Packard. Plate 13, fig. 66.

Eutrapela falcata Pack., Proc. Bost. Soc. Nat. Hist., xvi, 39, pl. 1, fig. 32, 1874.

1 ♀.—A slighter moth than *E. transversata*, with the wings similarly angulated, and the apex of the fore wings rather more falcate than in *E. transversata*. The male antennae slightly slenderer than in *E. transversata*. Pale ochreous; head, body, and wings of the same hue. Fore wings with no lines, and with only a few scattered blackish speckles, a conspicuous black discal dot, and three subapical black spots, one just behind the costal edge. Hind wings with a few scattered specks and a distinct black discal dot. Beneath marked just as above, the three subapical and discal spots being reproduced. Wings a little more densely speckled with black, and the fore wings a little deeper ochreous.

Length of body, 0.65; of fore wing, 0.82; expanse of wings, 1.70 inches. California (Edwards).

This fine species may be at once known by the very acute falcate apex,

the want of lines on the wings, though the three subapical spots are apparently the remains of an extradiscal line, and by the three subapical large black spots. The front of the head is ochreous, like the rest of the body.

An egg retained on the end of the abdomen is apparently spherical, with numerous high and very distinct longitudinal ridges.

EUTRAPELA NUBILATA Packard. Plate 13, fig. 61, ♂, fig. 62, ♀.

Charodes nubilata Pack., Proc. Bost. Soc. Nat. Hist., xiii, 381, 1871.

3 ♂ and 1 ♀.—Closely allied in form and structure to *E. transversata*; the fore wings slightly more falcate and the hind wings a little less caudate. Fawn-colored, like dark individuals of *E. transversata*. Head, palpi, and body concolorous with the base and outer edge of the wing, being speckled with black scales and short strigæ. On the basal third of the wing is a very distinct, dark, zigzag, broad, diffuse, blackish band, not reaching the costa, being most distinct on the hind edge; the outer line is brown, and is curved on the submedian cell, thence going straight to near the apex where it is reflected at an acute angle on to the costa; the angle, however, is less acute than in *E. transversata*, and the reflected portion half as long. Just outside of this line are five diffuse blackish patches, one on the inner edge near the angle, the other resting on the apex, and forming a diffuse oblique line, which passes within the angle of the outer line. The median part of the wing between the two lines is clear fawny fawn-color, with obscure, large, transverse strigæ, not present elsewhere on the wing. The discal dot is large and distinct, smaller on the hind wings. Hind wings with thick diffuse strigæ, less fine than on the fore wings, and a single, outer, slightly sinuate, brown line, on the inner side of which the wing is clearer than elsewhere. Beneath, the wings are closely dotted with dark scales, with the outer lines reproduced, though most distinct on the hind wings.

♂.—Length of body, 0.65; of fore wing, 0.85; expanse of wings, 1.75 inch.

Sanzalito, Cal., December 28 (Behrens).

In the female (fig. 61), the fore wings are very much produced and the apex is very sharp, reminding one of *Drepanodes*, while the style of coloration is very much like that of *Drepanodes rarus*; the base and outer edge of the fore wings are darker than in the males, and there is more of a rusty shade along the extradiscal line than in any of the males.

EUTRAPELA FURCIFERATA, *sp. nov.* Plate 13, fig. 64.

2 ♂.—Of the usual fawn-color, as in *E. transversata*; wings uniform, without the usual transverse strigæ; palpi very stout, ascending; terminal joint small, conical, drooping; antennæ simple. Head violaceous-brown; thorax and body concolorous with the wings. Basal half of the costa with brown scales; no transverse lines; a v-shaped spot on the costa near the apex, dark, shaded within with grayish scales; an abbreviated broad band extending from the outer third of the inner margin to the third submedian nervule; within paler than on the sides. Discal dot small, black, present on both wings. Secondaries immaculate, with a faint line like that in the middle of the fore wings, much bent in the middle. Beneath, body and wings yellow-ochreous, with brown scales, arranged in a diffuse line of speckles, which are especially distinct toward the costa, where the v re-appears; discal dots minute; base of costa brownish; legs brownish.

Length of body, 0.52; of fore wing, 0.70.

New York (A. R. Grote).

This species is easily known by its uniform fawn-color, by the two spots on the inner margin forming a short band going to the third submedian nervule, and the v-shaped spot near the apex; while the single diffuse line of scales and the line on the hind wings bent at quite an angle in the middle will also distinguish it. It is the smallest species known to us, while the palpi are stouter than usual. A second male, received from Missouri through Mr. Riley, is the one figured on plate 13. The extradiscal line on the fore wings is represented in the middle of the wing by two or three whitish venular dots. It is quite distinct from any of the varieties of *E. transversata*, in all of which the line on the hind wings is distinct and straight.

EUTRAPELA TRANSVERSATA Packard. Plate 13, figs. 63, 68; fig. 20, larva;
20 a. pupa.

Phalaena transversata Drury, i, 16, plate 8, fig. 2, 1770.

Geometra transversata Drury (Westwood's ed.), i, 16, plate 8, fig. 2, 1837.

Charodes incurvata Guen.!!!, Phal., i, 37, plate 3, fig. 2, 1857.

Charodes transversata Guen.!!!, Phal., i, 38, 1857.

Charodes goniata Guen.!!!, Phal., i, 38, 1857.

Charodes incurvata Walk.!!!, List Lep. Het. Br. Mus., xx, 15, 1860.

Charodes transposita Walk.!!!, List Lep. Het. Br. Mus., xx, 15, 1860.

Charodes transversata Walk.!!!, List Lep. Het. Br. Mus., xx, 15, 1860.

Charodes transcurtus Walk.!!!, List Lep. Het. Br. Mus., xx, 16, 1860.

Charodes transmutans Walk.!!!, List Lep. Het. Br. Mus., xx, 17, 1860.

Charodes contingens Walk.!!!, List Lep. Het. Br. Mus., xx, 18, 1860.

15 ♂ and 15 ♀.—Wings acutely angled in the middle of the outer edge, and fore wings very falcate; hind wings extending farther than usual behind the tip of the abdomen. Fawn-color, sometimes frosted over and varying to ochreous; body concolorous with the wings, which are more or less striated. Head with the front chocolate-brown; vertex white. Fore wings with the inner line usually present, curved, consisting of two large scallops meeting on the median vein and pointing inward, the upper scallop touching the discal dot, or the line is straight below the dot and parallel with the outer line; the line is sometimes either absent, or represented by a few scattered patches, and when well developed is dark fawn-brown, with or without a frosty edging on the inside. Outer line straight, more or less distinctly angled near the apex, and bending at right angles on the costa; sometimes the angle is much rounded, brown or black-brown, simple, or edged externally with gray. From the angle extends a more or less distinct slightly-curved series of irregular diffuse dark spots to the inner angle; this is usually represented by a faint shade. Discal dots alike in both wings, small, consisting of erect black scales. Hind wings with the single line in the middle of the wing, straight, with the outer series of diffuse spots as on the fore wings. Fringe a little deeper in hue than the wings, varying in hue between an ochreous or fawn color. Beneath, a little paler than above; line not present, or very faint, distinctly dusted with transverse strigæ. Legs strigated.

Length of body, ♂, 0.72–0.85, ♀, 0.65; of fore wing, ♂, 0.90–1.00, ♀, 0.95–1.00; expanse of wings, 2.00–2.10 inches.

Montreal, Canada (Lyman); Brunswick, Me. (Packard); Massachusetts (Sanborn, Emerton, Bost. Soc. Nat. Hist., Peab. Acad. Sc.); West Farms, N. Y. (Angus); Albany, N. Y. (Lintner and Meske); New Jersey (Sachs); Philadelphia (Ent. Soc.); Georgia (Grote); Detroit, Mich. (Mus. Comp. Zoöl.); Lawrence, Kans. (Snow); Missouri (Riley).

This is a very variable species, and in the above description we have noted the extremes. It may be distinguished by the very falcate wings, the obtusely-angled outer line on the fore wings, the submarginal shade or row of spots on both wings. The ochreous variety, which I take to be *goniata*, would easily be considered a separate species from *transversata* Guen.; but they are intermediate forms; so one of the Georgia males is dark, uniformly fawn-colored, with the margin of the wings beyond the outer line darker, and would be at first thought specifically distinct.

Larva.—Rather slender compared with larva of *E. clemataria*; a sharp dorsal tubercle on the third thoracic ring; a broad dorsal wart just behind the middle of the body, and a lateral sharp one in the middle of the body. A dorsal hump between the two pairs of abdominal feet. Body violaceous, transversely striped with reddish. Pupa pale brown, spotted with reddish-brown. Feeds on *Clethra alnifolia*.—(Described and the larva figured from Abbot's MS. drawing.)

Mr. Emerton has found the larva in Salem, on the currant, at the end of July; the moth appeared August 6. Mr. W. H. Patton reared the moth from the pupa (figured on plate 13) in New Haven, July 26. I think that it also feeds on the red maple.

From an examination of M. Guenée's and Walker's types, I have been led to arrive at the conclusions given in the synonymical table of this species. Fig. 63 represents Guenée's *transversata*, 68 his *goniata* (which is Drury's *transversata*). Walker's *transposita* is equivalent to Guenée's *transversata*; and his *transversata* is equal to Guenée's *goniata*. The species of Walker are based on individual variations of Drury's *transversata*.

EUTRAPELA CLEMATATA Hübner. Plate 13, fig. 69.

Phalana clemataria Smith-Abbot, Lep. Georgia, ii, 201, pl. 101, 1797.

Eutrapela clemataria Hübner, Exot. Schmin., i, 1806.

Eugonia clemataria Hübner, Verz., 292, 1818.

Eutrapela clemataria Guen.,!!!, Phal., i, 47, 1857.

Walk.,!!!, List Lep. Het. Br. Mus., xx, 35, 1860.

Charodes transducens Walk.,!!!, List Lep. Het. Br. Mus., xx, 18, 1860.

Charodes transfreus Walk.,!!!, List Lep. Het. Br. Mus., xx, 19, 1860.

3 ♂ and 1 ♀.—Antennæ subpectinated. Wings very falcate, especially in the female, where they are produced into a long point. Body and wings fawn-color, with scattered black dots; front of head reddish-brown; vertex white. Abdomen a little shorter than the hind wings. Hind tibiae slightly swollen. Fore wings with two inner, reddish-brown, diffuse lines; the inner situated half-way between the base of the wing and discal dot, curved and more or less scalloped, the outer curved, situated just beyond the discal dot, and joining the third, outer line on the second median venule; it is broader and still more diffuse than the basal line. Outer line straight, bent back at a very acute angle on to the costa, the line above the bend being more or less angularly curved and dilated on the costa; an oblique white line extends from the bend to the costa just before the apex, which is white above and blackish below, with a large reddish-brown patch extending from below the

apex to the second median venule. Discal dots in both wings black; scales flattened as usual. Hind wings with a single slightly-curved line just beyond the middle of the wing. Beneath, the outer line faintly reappears on the front part of the fore wing; the black specks are larger than above and not transverse as in *E. transversata*, and the edge of the wings is faintly grayish.

Length of body, ♂, 0.72–0.80, ♀, 0.80; of fore wing, ♂, 0.95, ♀, 1.05; expanse of wings, 2.20 inches.

Montreal, Canada (Lyman); Maine (Packard); New Haven, Conn. (Smith); West Farms, N. Y. (Angus); Albany, N. Y. (Liutner); Missouri, May 5 (Riley).

Larva.—The caterpillar is represented by Abbot as being thick and fleshy, with the third thoracic ring swollen above, and with four sharp dorsal tubercles. It is pale, with a purplish tint, and mottled with brown. Food-plant, *Pyrrhopygus carolinianus*. Abbot in the published work states that the larva feeds on *Clematis rosea*.

Addenda and Desiderata.

GLAUCOPTERYX CRETACEATA Packard. Plate 8, fig. 15.—*Larentia cretacea* Pack., Sixth Rep. Peab. Acad. Sc., 40, 1874.—3 ♀. Fore wings long and pointed. Hind wings much smaller and more rounded than in *G. caesiata* and *polata*. Chalky-white throughout, with numerous partially obsolete, wavy, ashen lines on the middle of the wing, but distinct on the costa. An oblique row of dark dots just beyond the middle of the wing, the row following a straight course. Hind wings marked as on the anterior pair with numerous ashen, obscure, parallel, wavy lines. Beneath whitish, shining, with a smoky tinge, especially on the fore wings, with numerous wavy ashen lines. Discal dots small but distinct. A narrow, interrupted, black line along the edge. Fringe whitish, dirty white externally. Fore legs dusky-whitish; hind legs whitish, broadly ringed with dusky-ash.

Length of body, 0.43; fore wings, 0.68; expanse of wings, 1.40 inches. White Mountains, N. H. (Samborn); Sierra Nevada (Edwards).

The New Hampshire specimen does not differ from the California ones.

Description of larva of Plemysia flurcata (gemmata).—Vingt œufs envirois ont été pondus par une *gemmata* que j'ai rencontrée le 27 janvier dans l'intérieur de Cannes, appliquée contre un mur. Le 11 février, ces œufs sont éclos; de vert obscur qu'ils sont d'abord, ils deviennent d'un jaune orange.

Au moment de l'éclosion la chenille est d'un jaune terneux, couleur qu'elle conserve jusqu'à sa troisième mue. À cette époque, celle du 10 mars, elle passe au vert clair et acquiert des lignes dorsales mal indiquées. Elle grossit alors rapidement et atteint son entier développement vers la fin de mars. Elle est à cette époque assez longue, cylindrique, à peine atténuée en avant, peu carénée sur les côtés, avec les lignes mal écrites. Cette ponte m'a donné autant de sujets verdâtres que d'individus d'un brun jaunâtre; il serait donc difficile de préciser quelle est celle de ces deux chenilles qui doit représenter le type, d'autant que les larves que j'ai rencontrées dans la nature, en novembre et en décembre, sous des touffes de Chrysanthèmes et d'Anthémis, étaient brunes et quelques-unes presque noires. Des lignes ordinaires on ne voit guère que la sous-dorsale qui est largement interrompue, et à la place de la vasculaire, on distingue, à l'incision des anneaux du milieu, une tache en forme d'omeron rougeâtre à fond vert clair. La stigmatale se détache à peine en couleur plus claire que le fond; elle est ondulée et porte les stigmata qui, vus à la loupe, paraissent de couleur orange; ils sont circlés de brun et reposent sur un fond clair. Une ligne, d'un vert obscur, parcourt le ventre, du 4^e au 9^e segment. La tête est petite, globuleuse. À fond vert ou jaunâtre, marquée de nombreux points pourprés. Les dix pattes sont concolores; les anales sont lavées de vineux à l'extrémité. On ne voit aucun des points ordinaires.

Cette chenille se tient ordinairement un peu recourbée, soit à découvert sur une tige, soit cachée au pied de la plante. Il n'est pas, je crois, de larves qui se fixent aussi solidement à la plante qui les supporte que celle de la *Camp. gloriata*. On la trouve aux environs de Fréjus, de Cannes et de Nice, sur une foule de plantes, telles que l'*Anthemis maritima*, le *Chrysanthemum segetum*, le *Convolvulus lineatus*, l'*Myssum maritimum*, etc.; mais ce sont le plus souvent les Anthémis et les Chrysanthèmes qui les fournissent dans les lieux incultes, et même dans les jardins.

Sa chrysalide est rapidement formée au centre de feuilles sèches, retenues par des fils de soie. Elle est médiocrement allongée, brune, lavée de rougeâtre sur les anneaux, et de verdâtre sur les ailes et les yeux. La pointe abdominale est garnie de cinq à six petits crochets recourbés. L'éclosion a lieu du 20 au 25 avril.

Divers sujets se sont facilement accouplés en captivité. Les œufs qui en provenaient sont éclos et les chenilles ont réussi. Les générations

de cette géomètre doivent se succéder sans interruption en Provence; excepte peut-être pendant les grandes sécheresses qui, sur le littoral, sont un temps d'août pour les plantes basses surtout, notamment pour les Anthémis et les Chrysanthèmes dont les fleurs paraissent être la principale nourriture de notre chenille. Les plantes, on le sait, refleurissent en automne.

(Milliere in Annales de la Société linnéenne de Lyon, 1868, nouv. série, tom. xvi, Paris, 1868, p. 50, pl. 90, figs. 7, 8.)

Hypagyretis pastularia Hübn., Zutr., 20, figs. 103, 104, 1818.—Georgia.

Nemoria histriaria Hübn., Zutr., 25, figs. 139, 140, 1818.—Georgia.

Dysstroma morosata Hübn. Geyer, Zutr., 21, figs. 879, 880, 1837.—North America.

Walker describes in the Canadian Naturalist and Geologist, v, 1860, *Endropia annisaria*, 260; *Acidalia similaria*, 261; *Acidalia anticaria*, 262; *Pellonia successaria*, 262; *Lozogramma subaquaria*, 262; *Numeria inceptaria*, 263; *Scotosia affirmaria*, 264; *Macaria pilosaria*, 266; in vol. vi, *Acidalia junctaria*, 39; *Macaria? subapiciaria*, 40; *Melanippe propriaria*, 40; *Coremia? palparia*, 40; *Cidaria lactispargaria*, 41.

Aspilates gilvaria (S. V.), introduced from Europe, occurs in Labrador, Moeschler, Beiträge Wiener Ent. Monatschrift, viii, No. 6, 1866.

Phasiane orillata occurred on Guadelupe Island, off the coast of California (Dr. Palmer). It expands 1.50 inches, and the specimen is the largest one I have yet seen.

Phibalapteryx intestinata was found in Colorado by Lieutenant Carpenter; *Aspilates coloraria* and *dissimilaria*, *Acidalia inductata*, and *Thamnonoma sulphuraria* have been received from Glencoe, Nebr., through Mr. G. M. Dodge.

Tornos rubiginosaria.—Larva, plate 13, fig. 3; pupa, 3*a*.—Body rather thick; head narrower than the body; six dorsal conical tubercles, the third very large and high; body brown, with oblique, whitish slashes, shaded with dark brown. Pupa dark brown, rather thick. Food-plant, *Coreopsis auriculata*, or probably *grandiflora*.—(Described from Abbot's MS.)

Semiothisa notata.—Larva, plate 13, fig. 24; pupa, 24*a*.—Body cylindrical; head small, spherical, not so wide as the body, which is grass-green, with a lateral and subdorsal white stripe. Pupa slender, pale reddish-brown. Food-plant, *Lactuca graminifolia*. (Abbot's MS.)

Acidalia ordinata.—Larva, plate 13, fig. 16; pupa, 16*a*.—Body very long and slender, smooth, cylindrical, thicker at the end than toward the head, pale flesh-colored, with a red subdorsal stripe and transverse reddish and plumbeous stripes. Pupa reddish; beneath, on the mouth-parts, and thorax greenish. Food-plant, *Trillium stylosum*. (Abbot's MS.)

Ceratonyx satanaria Guen., Phal., i, 194; larva, plate 2, fig. 2, 1857.—“Je la décris d'après un dessin d'Abbot. 50^{mm}. Ailes d'un brun-noir avec des places blanchâtres; supérieures avec trois lignes transverses plus foncées; les deux premières arquées et parallèles, la troisième anguleuse au milieu. Un trait basilaire et deux autres traits semblables superposés, près du sommet. Deux points au dessous, près du sommet. Deux points au dessous, près de l'angle interne. Intérieures unies. Géorgie américaine, en février.

“Chenille grise, avec la tête, les cornes, trois bourgeons sur le 5^e anneau, et un autre sur le 11^e, une ligne latérale du 5^e au 11^e, et toutes les pattes, d'un roux-ferrugineux. La tête est arrondie; les deux cornes du cou sont très-longues, large, aiguës, droites, dressées. Les bourgeons sont épais et arrondis. Elle vit en avril sur le *Liquidambar styraciflua* et le *Quercus dentata*. La chrysalide est d'un gris à peine rougeâtre.”

Erelis pyrolaria Guen., Phal., i, 324, 1857.—“23^{mm}. Ailes oblongues, entières, d'un gris-foncé un peu violâtre, comme chez la *rectaria*, avec quelques atomes noirs clair-semés. Supérieures avec trois lignes noirs très-fines: la première (extrabasilaire) arquée, les deux autres (condée et ombre médiane) sinuenses, très-rapprochées surtout par en bas, avec un point noir cellulaire entre elles. Point de subterminale. Ailes inférieures avec deux lignes médianes encore plus fines et disposées comme les deux dernières des supérieures. Dessous des quatre d'un gris uni, avec deux lignes ou ombres médianes formées par des atomes. Amérique septentrionale, en août.

“Chenille plissée, d'un gris-testacé foncé, avec les incisions et une stig-matale noirâtres partant du 3^e jusqu'au 10^e anneau. Tête et pattes concolores. Elle vit sur la *Pyrola umbellata* et deux autres plantes dont le nom américaine seul m'est connu. Elle file dans des feuilles vers le commencement d'août, et le papillon éclôt dès le milieu du même mois.”

Lepiodes scolopacinaris Guen., Phal., ii, 360, 1857.—“26^{mm}. Ailes concolores, d'un brun-roussâtre, avec les écailles du point cellulaire noires. Les

supérieures ayant une bordure assez large, d'un gris-noir un peu plombé, semé d'écailles blanchâtres, un peu en relief, et bordé de petits points noirs internervuraux. Inférieures avec un petit trait cellulaire suivi d'une ligne noirâtre un peu ondulée, et une bordure comme aux supérieures. Dessous à dessins plus vagues. Antennes garnies de lames régulières et serrées. Palpes droits et formant un bec court.—♀ plus grande, plus oblongue, d'un testacé-jaunâtre clair, avec la bordure très-détachée, précédée d'une ligne ou ombre d'un brun-ferrugineux. Faisceau d'écailles cellulaire, traversé par une ligne brune (ombre médiane) placée entre deux séries de points (coudée et extrabasilaire). Ailes inférieures semblables, mais semées, à la base, d'atomes noirs. Abdomen marquée de deux séries de points à peine sensibles. États-Unis d'Amérique. Un ♂, une ♀.

“Quoique ces deux individus soient très-dissemblables, comme on y retrouve à peu près les mêmes dessins, je pense que ce ne sont que les deux sexes d'une même espèce. Néanmoins, il est possible qu'on retrouve les sexes opposés, ou, encore, qu'ils soient des variétés d'une même espèce. La ♀ rappelle, pour les couleurs, notre *Xilophsia scolopacina*.”

ERRATUM—Page 193, for *harciata*, read *harvejata*.

NOTE.—Contrary to my first intention, the descriptions of nearly every species described by Guenée and Walker, but not seen by me, have been copied into this work, so as to render it as complete as possible.

THE GEOGRAPHICAL DISTRIBUTION OF THE PHALENIDÆ OF THE UNITED STATES.

The following remarks are based on the species which I have been able to examine, and not those noticed in the preceding pages under the head of *Desiderata*. The material has been scanty, and therefore the following essay should be regarded as merely a provisional sketch of the subject, which will require years of research to render at all complete.

The Phalenid moths of America north of Mexico and the West Indies may be divided into those which are inhabitants of the Arctic Realm and North Temperate Realm, adopting these terms as restricted by Mr. J. A. Allen.* The species belonging to the Arctic realm may be divided into two assemblages—one the high Arctic region, embracing Greenland and the northern coast of Labrador, and in one case (*G. polata*) the alpine summits of Lapland. They have not as yet occurred south of the isotherm of 32°, viz, on the alpine summits of New England or the Rocky Mountains. The list comprises but four species, and there seems to be no alpine zone comprising them.

PURELY ARCTIC SPECIES NOT FOUND SOUTH OF GREENLAND OR LABRADOR NOR ON ALPINE SUMMITS.

Glaucopteryx polata.

sabiniaria.

Glaucopteryx phocaria.

Acidalia sentinaria.

The species which apparently range between the isotherm of 32° and 44° F., and are circumpolar in their distribution, and in Europe and America often extend southward into the lowlands of the North Temperate Realm, may be placed under the following head (those living in Europe have an asterisk (*))

* On the Mammals and Winter Birds of East Florida, etc., Bull. Mus. Comp. Zool., in 3, 1871.

placed opposite their name, and those confined to the Atlantic Province only have a dagger (†) :

SUBARCTIC SPECIES MOSTLY COMMON TO EASTERN AND WESTERN AMERICA,
AND EUROPE-ASIA.

*Glaucopteryx caesiata.	*Petrophora populata.
magnoliata.	*Ochyria ferrugata.
Epirrita *†cambricaria (also Siberia).	*munitaria.
*dilutata).	abrasaria.
*Hydriomena trifasciata.	Rheumaptera basaliata.
*Petrophora truncata.	*fluctuata.
hirsiliata.	*lugubrata.
eunigerata.	*tristata.
prunata (vars. lugubrata and nubilata).	*bastata.
	*Carsia paludata.
	*Operhoptera boreata.

These species are in part members of the Canadian fauna, which is, perhaps, not so distinctly marked for insects as for birds; they also follow the isothermals of 44° and 48° southward into Colorado and California. In Colorado, they range from an elevation of about 8,000 feet to the limit of trees (11,000 feet). It will be observed by an examination of the isothermal line of 44° (on the Smithsonian chart) that it runs south of Eastport, Me., passes through Augusta, Me., runs north of Concord, N. H., and then sweeps up so as to embrace Lake Champlain, curves south of the Adirondack Mountains, then makes a sudden sweep in a northeasterly direction so as to embrace Montreal; then crosses Lakes Huron and Michigan a little south of Mackinac, including Lakes Erie and Ontario; thence taking a general northwesterly course to the base of the Rocky Mountains near Helena, Mont. On the Pacific coast it surrounds the Cascade range and the Sierra Nevada. But at Victoria, Vancouver's Island, where Mr. Crotch collected several of the forms, the annual temperature is from 48° to 52° F., corresponding to the temperature of Southern New England and New York, Pennsylvania, and the greater part of Ohio and the Alleghany Mountains, or the Alleghanian fauna.

The following species occur east of the Great Plains and north of Mexico, a few extending into Colorado:

SPECIES INHABITING THE EASTERN PROVINCE OF THE NORTH TEMPERATE

REALM.

Eupithecia albicapitata.	Rhenmaptera unangulata
absynthiata.	lacustrata.
zygadeniata.	lugubrata.
miserulata.	tristata.
luteata.	hastata
strattonata.	Anticlea vasilata.
ravocostaliata.	Phibalapteryx latirupta.
Glaucopteryx magnoliata.	intestinala.
Plemyria fluviala.	Hydria undulata.
, multilincata.	Philereme albosignata.
Epirrita perlineata.	Triphosa dubitata.
cambricaria.	Lobophora inequaliata.
Thera contractata.	montanata.
Hydriomena trifasciata.	viridata.
californiata.	vernata.
Petrophora truncata.	anguilincata.
hersiliata.	geminata.
cunigerata.	Odezia albovittata.
prunata.	Heliomata intulata.
albolincata.	elaborata.
atrocolorata.	cycladata.
testata.	Heterophelps harviciata.
populata.	triguttata.
diversilincata.	Operhoptera boreata.
Ochyria munitaria.	Aspilates pervaria.
lignicoloraria.	coloraria.
abrasaria.	dissimilaria.
designata.	linteraria.
ferrugaria.	Chloraspilates bicoloraria.
Rhenmaptera ruficillata.	Stenaspilates meskearia.
basaliata.	Tornos rubiginosaria.
parinotata.	approximaria.
fluctuata.	Zerene catenaria.
intermediata.	Haematopsis grataria.

SPECIES INHABITING THE EASTERN PROVINCE OF THE NORTH TEMPERATE
REALM—Continued.

<i>Lythria rilevaria.</i>	<i>Semiothisa enotata.</i>
<i>snoviaria.</i>	<i>bisignata.</i>
<i>Eutidonia notataria.</i>	<i>minorata.</i>
<i>Perconia fimetaria.</i>	<i>preatomata.</i>
<i>Fidonia truncataria.</i>	<i>distribnaria.</i>
<i>Ematurga faxonaria.</i>	<i>Eumacaria brunnearia.</i>
<i>Orthofidonia exornata.</i>	<i>Corycia vestaliata.</i>
<i>Caripeta divisaria.</i>	<i>semiclarata.</i>
<i>angustioraria.</i>	<i>Endeclinia herminiaata.</i>
<i>Lozogramma disconventa.</i>	<i>Deilinia variolaria.</i>
<i>detersata.</i>	<i>erythemaria.</i>
<i>atropunctata.</i>	<i>pacificaria.</i>
<i>defluata.</i>	<i>Gueneria basiaata.</i>
<i>Eufitchia ribearia.</i>	<i>Stegania pustularia.</i>
<i>Thamnonoma wavaria.</i>	<i>Goniacidalia furciferata.</i>
<i>subcessaria.</i>	<i>Calledapteryx dryopterata.</i>
<i>brunnearia.</i>	<i>Callizzia amorata.</i>
<i>sulphuraria.</i>	<i>Calothyranis amaturlaria.</i>
<i>argillacearia.</i>	<i>Euacidalia sericeata.</i>
<i>Marmopteryx strigularia.</i>	<i>floridata.</i>
<i>Phasianc atrolasciata.</i>	<i>Eois gemmata.</i>
<i>orillata.</i>	<i>ferrugata.</i>
<i>snoviata.</i>	<i>Asthena lucata.</i>
<i>mellistrigata.</i>	<i>albogilvaria.</i>
<i>trifasciata.</i>	<i>Acidalia ossulata.</i>
<i>Psammotodes eremiata.</i>	<i>perirrorata.</i>
<i>Semiothisa s-signata.</i>	<i>longipennata.</i>
<i>californiata.</i>	<i>peralbata.</i>
<i>dislocaria.</i>	<i>punctofimbriata.</i>
<i>ocellinata.</i>	<i>productata.</i>
<i>punctolineata.</i>	<i>pammaria.</i>
<i>granitata.</i>	<i>albocostaliata.</i>
<i>multilineata.</i>	<i>insulsaria.</i>

SPECIES INHABITING THE EASTERN PROVINCE OF THE NORTH TEMPERATE
REALM—Continued.

<i>Acidalia rotundopennata.</i>	<i>Paraphia subatomaria.</i>
<i>nivosata.</i>	<i>deplanaria.</i>
<i>ordinata.</i>	<i>Tephrosia cognataria.</i>
<i>Ephyra pendulinaria.</i>	<i>anticaria.</i>
<i>myrtaria.</i>	<i>cribrataria.</i>
<i>Euephyra serrulata.</i>	<i>canadaria.</i>
<i>Dyspteris abortivaria.</i>	<i>Cynatophora crepuscularia.</i>
<i>Eucrostis zelleria.</i>	<i>psilogrammaria.</i>
<i>chlorolencaria.</i>	<i>plumosaria.</i>
<i>Nemoria suberocata.</i>	<i>5-linearia.</i>
<i>gratata.</i>	<i>pampinaria.</i>
<i>pistaciata.</i>	<i>humaria.</i>
<i>Annemoria unitaria.</i>	<i>larvaria.</i>
<i>Synchlora excurvaria.</i>	<i>polygrammaria.</i>
<i>rubivoraria.</i>	<i>umbrosaria.</i>
<i>rubrifrontaria.</i>	<i>Bronchelia hortaria.</i>
<i>Aplodes rubrifrontaria.</i>	<i>Hemerophila unitaria.</i>
<i>brunnearia.</i>	<i>Stenotrachelys approximaria.</i>
<i>mimosaria.</i>	<i>permagnaria.</i>
<i>rubromarginaria.</i>	<i>Cleora pulchraria.</i>
<i>rubrolineata.</i>	<i>Hyperetis nyssaria.</i>
<i>latiaria.</i>	<i>Plagodis phlogosaria.</i>
<i>approximaria.</i>	<i>fervidaria.</i>
<i>Geometra iridaria.</i>	<i>keutzingaria.</i>
<i>Anisopteryx autumnata.</i>	<i>alcoolaria.</i>
<i>vernata.</i>	<i>serinaria.</i>
<i>Phigalia strigataria.</i>	<i>Nematocampa filamentaria.</i>
<i>Hybernia filiaria.</i>	<i>Angerona crocataria.</i>
<i>Eubyja quernaria.</i>	<i>Opisthograptis sulphuraria.</i>
<i>cupidaria.</i>	<i>Sicya macularia.</i>
<i>cognataria.</i>	<i>Antepione depontanata.</i>
<i>Biston ursaria.</i>	<i>sulphurata.</i>
<i>Paraphia unipunctaria.</i>	<i>Epione mollicularia.</i>

SPECIES INHABITING THE EASTERN PROVINCE OF THE NORTH TEMPERATE
REALM—Continued.

Anagoga pulveraria.	Endropia serrataria.
Metrocampa perlaria.	Azelina hübnerrata.
Therina fervidaria.	Selenia alciphæaria.
endropiaria.	kentaria.
seminudaria.	Eugonia subsignaria.
Epirrhantis obfirmaria.	alniaria.
Endropia pilosaria.	Caberodes cervinaria.
apiciaria.	cayennaria.
duaria.	confusaria.
hypochraria.	majoraria.
marginataria.	Drepanodes varus.
vinulentaria.	puber.
textrinaria.	Metanema carnaria.
madusaria.	inatomaria.
amcenaria.	quercivoraria.
armataria.	Tetracis lorata.
bilincaria.	crocallata.
pectinaria.	Entrapela fureciferata.
effectaria.	transversata.
obtusaria.	clematata.

These species may be divided into two assemblages (*a* and *b*), corresponding in part (1) to the Alleghanian and Carolinian and (2) the Louisianian faune of the ornithologists. The limits of the first two faune, as applied to the Geometrids, are approximately between the isothermals of 48° and 60° F., and embrace the Middle States as far west as the eastern borders of Indian Territory, Kansas, and Nebraska. It corresponds in the main to Dr. LeConte's middle and western province of the Atlantic district.* My local lists are too scanty to be more definite, and it is probable that two or three (the third, the Canadian) lepidopterological faune will ultimately be established. A number of the species may, and do, extend south and north of these limits, as well as to the westward, and they include some

* The *Caloptera* of Kansas and Eastern New Mexico. By J. L. LeConte, M. D. Smithsonian Contributions, xi, 1-59.

members of the Canadian fauna. Those which are *probably* members of the Carolinian fauna have an asterisk (*) prefixed.

(a) *Species found in the limits of the Alleghanian and Carolinian fauna.*

Eupithecia albicapitata.	Lobophora viridata.
absynthiata.	vernata.
miserulata.	anguilineata.
luteata.	geminata.
strattonata.	Odezia albovittata.
ravocostaliata.	*Helionata intulata.
Plemyria fluviala.	*elaborata.
multilineata.	*cycladata.
Epirrita perlineata.	Heterophelps barveata.
Thera contractata.	triguttata.
Hydriomena trifasciata.	Operhoptera boreata.
californiata.	*Aspilates lintneraria.
Petrophora truncata.	*liberaria.
prunata (normal form).	Zerene catenaria.
albolineata.	Hæmatopsis grataria.
atrocolorata.	*Lythria rilevaria.
diversilineata.	Eufidonia notataria.
Ochyria lignicolorata.	Fidonia truncataria.
designata.	Ematurga faxonaria.
ferrugaria.	Orthofidonia exornata.
Rheumaptera ruticillata.	Caripeta divisaria.
intermediata.	angustioraria.
lacustrata.	Lozogramma disconventa.
unangulata.	detersata.
Anticlea vasiliata.	atropunctata.
*Phibalapteryx latirupta.	delluata.
intestinata.	Eufitchia ribearia.
Hydria undulata.	Thamnonoma wavaria.
Triphosa dubitata.	subcessaria.
Lobophora inequaliata.	sulphuraria.
montanata.	brunnearia.

(a) *Species found in limits of Alleghanian and Carolinian faune*—Continued.

Thammonoma argillaccaria.	Epiphyra myrtaria.
Marmopteryx strigularia.	Eucrostis chloroleucaria.
Phasiane orillata.	Nemoria suberoceata.
mellistrigata.	gratata.
trifasciata.	pistaciata.
Psammotodes cremiata.	Synchlora rubivoraria.
Semiothisa ocellinata.	rubrifrontaria.
granitata.	Aplodes rubrifrontaria.
multilineata.	mimosaria.
enotata.	rubromarginaria.
bisignata.	rubrolinearia.
minorata.	latiaria.
preatomata.	approximaria.
* Eumacaria brunnearia.	* Geometra iridaria.
Corycia vestaliata.	Anisopteryx autumnata.
semiclarata.	vernata.
Eudeilinia herminiata.	Phigalia strigataria.
Deilinia variolaria.	Hybernia tiliaria.
erythemaria.	Eubyja cupidaria.
Gueneria basiata.	cognataria.
Stegania pustularia.	Biston ursaria.
* Callizzia amorata.	Paraphia subatomaria.
* Eois ferrugata.	depluaria.
Asthena albogilvaria.	* Tephrosia cognataria.
lucata.	anticaria.
* Acidalia ossulata.	cribrataria.
productata.	canadaria.
insulsaria.	Cymatophora crepuscularia.
rotundopemata.	* pampinaria.
nivosata.	* humaria.
inductata.	larvaria.
4-lineata.	* umbrosaria.
cacuminata.	* Bronchelia hortaria.
enucleata.	* Hemerophila unitaria.
Epiphyra pendulinaria.	* Stenotrachelys approximaria.

(a) *Species found in limits of Alleghanian and Carolinian faunas*—Continued.

*Stenotrachelys permagnaria.	*Endropia tetrinaria.
Cleora pulchraia.	madusaria.
*Hyperctis nyssaria.	*hammonaria.
Plagolis phlogosaria.	*armataria.
fervidaria.	*bilincaria.
kentzingaria.	pectinaria.
alcoolaria.	effectaria.
serinaria.	*obtusaria.
Nematocampa filamentaria.	*serrataria.
*Angerona crocataria.	*Azelina hübnerrata.
Opisthograptis sulphuraria.	Selenia alciphœaria.
Sieya macularia.	kentaria.
Antepione depontanata.	Eugonia subsignaria.
sulphurata.	alniaria.
*Anagoga pulveraria.	*Caberodes confusaria.
Metrocampa perlaria.	*majoraria.
*Therina fervidaria.	*Drepanodes varus.
endropiaria.	*puber.
*seminudaria.	Metanema carnaria.
*Epirrhantis obfirmaria.	inatomaria.
Endropia pilosaria.	*quercivoraria.
apiciaria.	Tetracis lorata.
duaria.	crocallata.
hypocheiraria.	Eutrapela fusciferata.
marginataria.	*transversata.
vinulentaria.	*clematata.

The following species occur south of the isothermal of 60°, most of them having been found in Texas, and the territory corresponds to LeConte's Southern Province:

(b) *Species occurring within the limits of the Louisianian fauna.*

Eupithecia zygadeniata.	Phibalapteryx latirupta.
Rheumaptera parinotata.	Philereme albosignata.

(b) *Species occurring within the limits of the Louisianian fauna*.—Continued.

Aspilates pervaria.	Eucrostis zelleria.
coloraria.	chloroleucaria.
dissimilaria.	Synchlora excurvaria.
Chloraspilates bicoloraria.	Aplodes brunnearia.
Stenaspilates meskeraria.	Geometra iridaria.
Tornos rubiginosaria.	Anisopteryx vernata.
approximaria.	Eubyja quernaria.
Perconia finetaria.	Paraphia unipunctaria.
Phasiane atrofasciata.	Cymatophora psilogrammaria.
Senniorthisa s-signata.	plumosaria.
californiata.	5-linearia.
dislocaria.	pampinaria.
punctolineata.	humaria.
distribuaria.	larvaria.
Eumacaria brunnearia.	umbrosaria.
Goniacidalia furciferata.	Bronchelia hortaria.
Calledapteryx dryopterata.	Stenotrachelys approximaria.
Calothysanis amaturlaria.	Hyperetis nyssaria.
Euacidalia sericeata.	Angerona crocataria.
floridata.	Epione mollicularia.
Eois gemmata.	Therina fervidaria.
ferrugata.	Epirrhantis obfirmaria.
Acidalia ossulata.	Endropia tetrinaria.
perirrorata.	madusaria.
longipennata.	bilinearia.
peralbata.	obtusaria.
punctotimbriata.	Azelina hülnerata.
pannaria.	Caberodes cervinaria.
albocostaliata.	cayennaria.
rubromarginata.	confusaria.
ordinata.	Drepanodes varus.
Ephyra myrtaria.	Metaema quercivoraria.
Eucphyra serrulata.	Entrepela transversata.
Dyspteris abortivaria.	clematata.

Of these species, *Semiothisa cnotata* probably extends into Brazil; *Philereme albosignata* occurs in the Bermudas, and probably in the West Indies; and *Semiothisa ocellinata* occurs in the West Indies.

The following list embraces those found on the Pacific coast from Victoria, Vancouver's Island, to San Diego, Cal., with a few species occurring in Colorado and Kansas. It would be premature to subdivide this region into faune based on the facts thus far known. Local lists from this region are particularly desirable. An asterisk (*) is attached to the names of those which occur in Colorado, Kansas, or Utah only.

SPECIES OCCURRING IN THE WESTERN PROVINCE.

<i>Eupithecia rotundopunctata.</i>	<i>Ochyria abrasaria.</i>
<i>miserulata.</i>	<i>gueneata.</i>
<i>longipalpata.</i>	<i>carneata.</i>
<i>behrensata.</i>	<i>rubrosuffusata.</i>
<i>nevadata.</i>	<i>lacteata.</i>
<i>subapicata.</i>	<i>Rhemaptera brunneicellata.</i>
<i>Glaucopteryx caesiata.</i>	<i>basaliata.</i>
<i>magnoliata.</i>	<i>lacustrata.</i>
<i>implicata.</i>	<i>lugubrata.</i>
<i>Plemyria fluviala.</i>	* <i>tristata.</i>
<i>multilineata.</i>	<i>hastata.</i>
<i>Epirrita 12-lineata.</i>	<i>Hydria undulata.</i>
<i>Hydriomena californiata.</i>	<i>Philereme californiata.</i>
<i>sordidata.</i>	* <i>meadiata.</i>
<i>5-fasciata.</i>	<i>Triphosa dubitata.</i>
<i>speciosata.</i>	* <i>Lobophora montanata.</i>
<i>Petrophora truncata.</i>	<i>Odezia albovittata.</i>
<i>hersiata.</i>	<i>californiata.</i>
<i>mancipata.</i>	* <i>__ithostege triseriata.</i>
<i>prunata</i> (vars. <i>lugubrata</i> and <i>nubilata</i>).	<i>rotundata.</i>
<i>leoninata.</i>	<i>Gorytodes uncauaria.</i>
<i>testata.</i>	<i>trilinearia.</i>
<i>populata.</i>	* <i>Euaspilates spinataria.</i>
<i>flavata.</i>	* <i>Aspilates 4-fasciaria.</i>
<i>Ochyria munitaria.</i>	<i>Hematopis grataria.</i>
<i>lignicoloraria.</i>	* <i>Lythria snoviata.</i>
	* <i>Loxotidonia acidaliata.</i>

Two features of interest strike one in the distribution of the insects of the Pacific slope, viz. the absence of forms characteristic of Japan and China, and the presence of some European types which do not occur in the Eastern (Atlantic) province. We know so little of the Phalaenid fauna of China and Japan that our illustrations must be borrowed from other families and insects of other orders. Among the Phalaenids there are *Hadronema sordidata*, *Petrophora flavata*, two species of *Lithostega*, *Schulzeana*, *Gnophos*, etc., which do not occur in the Atlantic province, and are allied to species or belong to genera which occur in Europe, but do not inhabit North America east of the Rocky Mountains. In other families of Lepidoptera, *Papilio zolicon* represents the European *P. machaon*, while the genus *Parnassius* does not occur in the Atlantic province. The European Bombycid genera *Epicallia* and *Callaretia* do not occur in the Atlantic province. The Neuropterous genus *Rhaphidia* does not occur in the Atlantic States, while *Boreus californicus* is more like the European *B. hyemalis* than the two Atlantic species.

On the other hand, we find in the Pacific States no such development of the genus *Lithosia* as in Europe, no species of *Zygema*, no true *Psachoda*, no such development of the genus *Hepialus*, and any species of *Lasaianapa* are wanting in California. We miss again in the Pacific States any species of *Tropaea*, a genus linking the Atlantic or Northeastern American entomological fauna with that of Northeastern Asia. California has evidently not borrowed her insect fauna from Northern China or Japan.

The main features in the geographical distribution of land-animals are apparently the same with those of plants. Prof. Asa Gray has shown* that "almost every characteristic form in the vegetation of the Atlantic States is wanting in California, and the characteristic plants and trees of California are wanting here" (*i. e.* in the Atlantic States). We may, on the whole, perhaps say of the Californian Lepidoptera at least as Dr. Gray remarks of the plants, that they are "as different from those of the Eastern Asiatic region (Japan, China, and Mandchuria) as they are from those of Atlantic North America. Their near relatives, when they have any in other lands, are mostly southward, on the Mexican plateau. . . . The same may be said of the [insects] of the intervening great plains, except that north-

* Address at Dubuque meeting of the American Assoc. Adv. Science, 1874.

ward and in the subsaline [insects*] there are some close alliances with the [insects] of the steppes of Siberia. And along the crests of high mountain-ranges, the arctic-alpine [insect-fauna] has sent southward more or less numerous representatives through the whole length of the country" (p. 10). He then refers to the astonishing similarity of the flora of the Atlantic United States with that of Northeastern Asia. Our actual knowledge of the insect-species of Northeastern Asia is most vague compared with that of the botanist, and the comparison we have drawn relates only to generic types.

SPECIES COMMON TO TEMPERATE AMERICA AND EUROPE.

<i>Eupithecia absynthiata.</i>	<i>Hydria undulata.</i>
<i>Plemyria fluviala.</i>	<i>Triphosa dubitata.</i>
<i>Hydriomena trifasciata.</i>	<i>Carsia paludata.</i>
<i>sordidata.</i>	<i>Operhoptera boreata.</i>
<i>Petrophora prunata</i> (normal form).	<i>Thamnomoma wavaria</i>
<i>testata.</i>	<i>brunnearia.</i>
<i>Ochyria designata.</i>	<i>Cymatophora crepuscularia.</i>
<i>ferrugaria.</i>	<i>Anagoga pulveraria.</i>
<i>Rheumaptera unangulata.</i>	<i>Eugonia alniaria.</i>

In the following list, the Colorado species are included in the Pacific province :

SPECIES COMMON TO THE ATLANTIC AND PACIFIC PROVINCES.

<i>Eupithecia miserulata.</i>	<i>Petrophora bersiliata.</i>
<i>Glaucopteryx cressiata.</i>	<i>prunata</i> (vars. <i>lugubrata</i> and <i>nubilata.</i>)
<i>magnoliata.</i>	
<i>Plemyria fluviala.</i>	<i>testata.</i>
<i>multilineata.</i>	<i>populata.</i>
<i>Hydriomena californiata.</i>	<i>Ochyria munitaria.</i>
<i>Petrophora truncata.</i>	<i>lignicoloraria.</i>

* Dr. LeConte has noticed the similarity of our saline-plains Coleoptera, comprising so many species of *Tenebrionida*, to the fauna of the deserts and steppes of Asia. (Proc. Amer. Assoc. Adv. Sci., 1851, Albany meeting, 252.) He also states that "the only manner in which the insect fauna of California approaches that of Europe is in the great abundance of apterous *Tenebrionida*. But in this respect it does not differ from a large part of South America; and by the very form of these *Tenebrionida*, which bear no resemblance at all to those of Europe, the greater relation of the Californian fauna to that of the rest of America is clearly proved."

SPECIES COMMON TO THE ATLANTIC AND PACIFIC PROVINCES—Continued.

<i>Ochyria abrasaria</i> .	<i>Aplodes rubrifrontaria</i> .
<i>Rhemaptera basaliata</i> .	<i>Geometra iridaria</i> .
<i>marginulata</i> .	<i>Tephrosia caudaria</i> .
<i>lugubrata</i> .	<i>Cynatophora larvaria</i> .
<i>hastata</i> .	<i>californiaria</i> .
<i>tristata</i> .	<i>Opisthograptis sulphuraria</i> .
<i>Hydria undulata</i> .	<i>Sicya macularia</i> .
<i>Triphosa dubitata</i> .	<i>Anagoga pulveraria</i> .
<i>Odezia albovittata</i> .	<i>Metrocampa perlaria</i> .
<i>Hamatopsis grataria</i> .	<i>Therina fervidaria</i> .
<i>Phasiane orillata</i> .	<i>Endropia madusaria</i> .
<i>Semiothisa californiata</i> .	<i>bilinearia</i> .
<i>granitata</i> .	<i>Azelina hübnereata</i> .
<i>Acidalia rubromarginata</i> .	<i>Selenia alciphœaria</i> .

Of the following genera, most are apparently of tropical origin, and those with an asterisk (*) are found on the Pacific slope only.

GENERA PECULIAR TO NORTH AND SOUTH AMERICA.

<i>Heliomata</i> .	<i>Gueneria</i> .
<i>Heterophleps</i> .	<i>Goniacidalia</i> .
* <i>Gorytodes</i> .	<i>Calledapteryx</i> .
* <i>Euaspiates</i> .	<i>Callizzia</i> .
<i>Chloraspilates</i> .	<i>Euacidalia</i> .
<i>Stenaspilates</i> .	* <i>Ceratodalia</i> .
<i>Tornos</i> .	<i>Eucphyra</i> .
<i>Zerene</i> .	<i>Dyspteris</i> .
<i>Hamatopsis</i> .	* <i>Annemoria</i> .
* <i>Loxofidonia</i> .	* <i>Chlorosea</i> .
* <i>Dasyfidonia</i> .	<i>Synchlora</i> .
<i>Orthofidonia</i> .	<i>Racheospila</i> .
<i>Caripeta</i> .	<i>Aplodes</i> .
<i>Eufitheia</i> .	<i>Anaplodes</i> .
<i>Marmopteryx</i> .	<i>Paraphia</i> .
<i>Eumacaria</i> .	<i>Bronchelia</i> .
<i>Eudeilinia</i> .	<i>Stenotrachelys</i> .

The following list embraces those genera mentioned by Guenée as occurring in Central and South America, chiefly the tropics, but which do not occur in the United States. Those which occur in Mexico have an asterisk (*) prefixed.

GENERA WHICH OCCUR IN CENTRAL AND SOUTH AMERICA.

Urapteryx.	Mecoceras.
*Ripula.	Almodes (Hayti).
Pericallia.	Palyas.
Odontopera.	Ophthalmophora.
Cirsodes.	Byssodes.
Sabulodes.	Numia (West Indies).
Mucronodes.	Cyphopteryx.
Cimicodes.	Anisodes (and East Indies).
Clysia.	Asellodes.
*Oxydia.	Trygodes.
Crocopteryx.	Hyria (and India).
Cratoptera.	Cambogia.
Gynopteryx.	Cleta (and Asia-Europe).
Tetragonodes.	Odysia.
Periclina.	Cnemodes.
Apieia.	Somatina (and Asia).
Melinodes.	Zanclopteryx (and Asia).
Drepanogynis (and S. Africa).	Berberodes.
*Synnomos.	Pigia (and Asia).
Hyperythra (and East Indies).	Syngria.
Leucula.	Falcinodes.
Erosina.	Erosia (Asia and Africa).
Synemia.	Schidax.
Metieulodes.	Molybdophora.
Bryoptera.	Syllexis.
Stellidia.	Acratodes.
Achlora.	Sphaelodes.
Phyle.	Cyclomia.
Amaurinia (and Asia).	Panaethia (and Borneo).
*Ametis.	Rhyparia (and Europe-Asia).

GENERA WHICH OCCUR IN CENTRAL AND SOUTH AMERICA—Continued.

Pantherodes.	Dineurodes.
Fulgurodes.	Sylarites.
Perigramma.	Psaliodes.
Bombycodes.	Terenodes.
Nipteria.	Hedyle.
*Cosmetodes.	Venodes.
Rhopalodes.	Phillinodes.
Scordylia.	Erateina.
Polysemia.	Emplocia.
Syrtodes.	

The following list comprises those European genera not found in America, and which are probably of Asiatic and African origin. The list, like the foregoing, is compiled from Guenée's work, Walker's lists not having been used, as they are so unreliable.

EUROPEAN GENERA NOT FOUND AS YET IN THE UNITED STATES.

Therapis.	Eupistheria.
Venilia (and Asia).	Pellonia (and Asia).
Crocallis (and Tasmania).	Alucis.
Himera.	Ellerina (and Asia).
Ghondrosoma.	Strenia.
Nyssia (and Asia).	Cinglis (and Asia).
Apocheima (Asia and Africa).	Rhoptria.
Nychiodes (and Asia).	Ploseria.
Calamodes.	Scodiona (and Africa and Tasmania).
Dasydia.	Eusarca.
Psodos.	Heliothea.
Pygmaea.	Cleogene.
Boletobia.	Anthometra.
Pseudoterpna (and Asia).	Minera.
Phorodesma (and Asia, Brazil, and Tasmania).	Scoria (and S. America).
Thetidia (and Africa).	Sterra (and Surinam).
Hemithea (and Asia).	Hypoplectis.

EUROPEAN GENERA NOT FOUND AS YET IN THE UNITED STATES—Continued.

Abraxas (and Asia).	Eubolia (and Asia, Africa, and
Ligdia (and Asia).	?Chili).
Lomaspilia.	Anaitis (and Asia).
Orthostixis.	Chesias.
Acalia.	Siona (and Asia).
Emmelesia.	Gypsochroa (and Asia).
Collix (and Asia and Africa).	Stannodes (and Asia).
Pelurga.	Tanagra.

Of the genera found in North America, species of *Heterolorcha* occur in Asia Minor, Abyssinia, Quito, and Venezuela, of *Hemerophila* in the East Indies and Asia; *Gnophos*, which has but a single species in North America (in Colorado), is very fully represented in Europe and Asia; *Iodis* occurs in Europe, Asia and India, Australia, Tasmania, and Brazil; *Acidalia* is cosmopolitan, species occurring in the several continents and Tasmania, Madagascar, Isle Bourbon, Mauritius, Cape of Good Hope, and Chili.

ON CLIMATIC VARIATION IN THE PHALLENIDÆ.*

In examining into some of the causes of variation among species, attention is naturally given first to the influence of meteorological or climatic agencies upon organisms. In order to study the variation due to climatic causes, it is necessary to have before us individuals from regions as wide apart as possible. In studying the subject as applied to our arctic and alpine species of Phalænidae, I have been fortunate enough to obtain individuals of the same species from Iceland, Norway, and the Alps of Central Europe, while the arctic species found in Labrador and the White Mountains have been studied under tolerably favorable auspices. In the summer of 1875, I was enabled, by a few weeks' connection with Professor Hayden's Survey, to make a superficial examination of the insect-fauna of Colorado and Utah above an elevation of 8,000 feet, and to do some work above timber-line on the alpine summits of Arapahoe, Gray's, and Pike's Peaks in Colorado. The results of my collecting fully confirmed the impressions I had received from the col-

*The remarks under this head are reproduced, with some additions and alterations from an essay "On the Geographical Distribution of the Moths of Colorado", in the Annual Report of the United States Geological and Geographical Survey of the Territories for 1873.

lections received from Lieutenant Carpenter, United States Army, and reported on by himself and me in Hayden's Annual Report for 1873. The results obtained by Lieutenant Carpenter enabled me to say "that on the peaks above a line of 12,000 feet, the fauna is as truly alpine as on the summits of the Alps or the top of Mount Washington in New Hampshire. Several species occur there which are also found on the Swiss Alps, as well as Mount Washington, and in Labrador and Greenland, at the level of the sea." Among the butterflies, *Oeneis semidea*, previously only found on the summit of Mount Washington, N. H., has been found by Lieutenant Carpenter at 12,000 feet elevation, and I found it at about the same elevation on Pike's Peak in the summer of 1875. This establishes the complete identity of the fauna of the alpine summits of the United States at or above the snow-line.

The following table shows the distribution of the alpine and arctic Lepidoptera up to this time known to inhabit the alpine summits of Colorado. It will be observed that no purely arctic Plukenet moth inhabits any alpine summit in the United States.

	Colorado.	Mount Wash- ington.	Labrador.	Greenland.	Iceland.	Lapland.	Alps.
<i>Oeneis semidea</i>	×	×					
<i>Arctia quenseli</i>	×	×	×				×
<i>Anarta melanopa</i>	×	×	×			×	×
<i>Agrotis islandica</i> *	×		×	×	×		
<i>Plusia hochenwarthi</i>	×		×			×	×

Besides *Anarta melanopa*, two other species (*A. quadrilunata* and *A. subfuscula* Grote) are recorded from Colorado by Mr. Grote. These two species are closely allied to *Anarta melanopa* and *richardsoni* (*A. albiga*) respectively. *Chionobas chryxus* has been found by Mr. W. H. Edwards to occur both in Colorado and Hudson's Bay, while another species (*C. uhleri*) inhabits Colorado.

The following table shows the distribution of fourteen species of *Phalaenidæ*, most of which are found in Colorado, between an elevation of

* The Colorado and Pacific coast form of this species is regarded by Mr. Grote as a distinct species, and described by him under the name of *Agrotis auribasis*. For my remarks on *claudia*, see Hayden's Annual Report, 1873, p. 555.

from 8,000 or 9,000 feet to about 11,000 feet, or the "timber-line"—*i.e.*, the limits of trees. They are subalpine and circumpolar species, and some also occur in the highlands of North Temperate America and Europe-Asia.

	Colorado or Pacific coast or both.	Mount Washington.	Labrador.	Iceland.	Lapland.	Alps of Central Europe.	Ural or Altai Mountains or both.
<i>Glaucopteryx caesiata</i>	×	×	×	×	×	×	×
<i>Epirrita caubricaria</i>		×				×	
<i>Epirrita dilutata</i>			×	×	×	×	×
<i>Hydriomena trifasciata</i>	×	×	×	×	×	×	×
<i>Petrophora truncata</i>	×	×	×	×	×	×	×
<i>Petrophora prunata</i> vars.....	×	×	×			×	
<i>Petrophora populata</i>	×	×	×			×	×
<i>Petrophora testata</i>	×					×	×
<i>Ochyria ferrugaria</i>	×	×	×	×	×	×	×
<i>Ochyria munitaria</i>	×		×	×	×	×	
<i>Rhenmaptera fluctuata</i>		×				×	×
<i>Rhenmaptera lugubrata</i>	×		×		×	×	×
<i>Rhenmaptera tristata</i>	×		×			×	×
<i>Rhenmaptera hastata</i>	×	×	×	×	×	×	×

Though *P. testata* and *R. lugubrata* have not occurred on Mount Washington, it is found in other parts of New England. We may also expect to find *Epirrita dilutata* in Colorado and the Pacific coast, as it is common in Newfoundland and occurs in Labrador and Canada, and will probably be found in the highlands of New England.

This table indicates how wide are the limits of distribution of these species, and it will be seen how important it is to follow circumpolar* and north-temperate insect-fauna around the globe, from continent to continent. It will then be seen how inadequate must be our views regarding the geographical distribution of the animals and plants of our own continent, without specimens from similar regions in the same zones in the Old World. It will be found that for the study of the insect-fauna of the Rocky Mountains and Pacific coast we must have ample collections from the Ural and Altai Mountains and surrounding plateaus, while a study of the Japanese and Hindoo-Chinese fauna must accompany examinations of the species of the Atlantic fauna; just as we are obliged, while examining the Atlantic fauna,

to study West Indian, Central American, and even tropical South American forms, several members of which spread as far north as the headwaters of the Mississippi, and even Maine and Canada.

The facts presented in the body of this work regarding the variation in size between Atlantic and Pacific coast examples of the same species, though scanty, indicate the existence of some interesting laws of climatic variation, which tend to confirm the generalizations established by Professor Baird* and Messrs. Allen and Ridgway as regards the avifauna of North America. I should, however, state that the fact of variation in shape of the wings, chiefly, however, variation in size, was forced upon me by a study of the specimens themselves, without at the time having the views of our ornithologists in mind. In all the species enumerated in the following list, the Colorado examples (when the species have been found to occur there) and the Pacific-coast individuals are larger, and in some cases with longer, more pointed wings than in those from Labrador or the Eastern Atlantic States, and in a few cases show a tendency to become lighter in color.

SPECIES GROWING TO A GREATER SIZE ON THE PACIFIC THAN ATLANTIC COAST.†

<i>Glaucopteryx caesiata</i> .	<i>Zerene catenaria</i> .
<i>magnoliata</i> .	<i>Phasiane orillata</i> .
<i>Ptemyria fluviala</i> .	<i>Semiothisa californiata</i> .
<i>Hydriomena californiata</i> .	<i>granitata</i> .
<i>Petrophora truncata</i> .	<i>Aplodes rubrifrontaria</i> .
<i>pruinata</i> var. <i>lugu-</i>	<i>Geometra iridaria</i> .
<i>brata nubilata</i> .	<i>Tephrosia canadaria</i> .
<i>Ochyria munitaria</i> .	<i>Opisthograptis sulphuraria</i> .
<i>abrasaria</i> .	<i>Anagoga pulveraria</i> .
<i>Rheumaptera basaliata</i>	<i>Metrocampa perlaria</i> .
<i>lugubrata</i> .	<i>Merina fervidaria</i> .
<i>Hydria undulata</i> .	<i>Endropia bilinearia</i> .
<i>Triphosa dubitata</i> .	<i>Azelina hibernata</i> .

* "The Distribution and Migrations of North American Birds," in Amer. Journ. Sc. and Arts, xii, Jan. and March, 1866. See also J. A. Allen, Bull. Mus. Comp. Zool., ii, 1871, "On Individual and Geographical Variation among Birds, &c.," and R. Ridgway, "On the Relation between Color and Geographical Distribution in Birds as exhibited in Melanism and Hyperchromism," in Amer. Journ. Sc. Arts, iv, Dec., 1872, p. 151; v, Jan., 1873, p. 39.

† To this list may be added the following species belonging to other families of moths: *Phorophorus cinereidactylus*, *Drasteria crechteni*, *Plusia Hocheneurtha*, *Agrotis islandica*, and *Lithosia orphileana*.

In a few cases, as in *Glaucopteryx asiata* and *Rheumaptera lugubrata*, the Pacific-coast specimens resemble the European examples more than those from the Atlantic coast.

It would seem as if these differences were almost wholly due to climatic causes. The climate of the Rocky Mountains and of Vancouver's Island is much warmer than that of Northern New England, the highlands of British America, and Labrador. The mean annual temperature of Victoria, Vancouver's Island, is 48° F.; that of New York City being 52° F., while that of Denver, Colo., is 48° F., and of the Rocky Mountains from 44° to 40° F.; that of Northern New England being from 44° to 40° F.; the White Mountains and the Adirondacks and the region north of the Great Lakes being 40° F., while that of Labrador is from 32° to 30° F. The annual rain-fall of Victoria, Vancouver's Island, is 36 inches; at the mouth of the Columbia River, it is 80 inches; while that of Saint John's, Newfoundland, is 63 inches (this is probably the same as that of the southern and eastern coast of Labrador). The rain-fall of Denver, Colo., is 12 inches, while, of course, that of the more elevated portions of the Rocky Mountains is probably nearly 20, though no data are given in the Smithsonian charts. The rain-fall of the Rocky Mountain region is colored in Guyot's map the same as that of the Ural and Altai Mountains. The annual rain-fall of Fort Dalles, Oreg., is 20 inches, while that of Walla-Walla, a little farther eastward, is 16 inches. On the other hand, that of Nertchinsk, in the Altai Mountains, is 17 inches, while that of Peking is 24 inches; so that the annual rain-fall of the elevated plateaus of Northeastern Asia and Colorado is nearly the same. Again, the annual rain-fall of the Alps, on their southern slopes, is from 60 to 90 inches; here we have conditions quite similar to those of the Cascade range in Oregon.

These meteorological facts seem to explain the corresponding zoö-geographical data given above. The warmer and more humid Pacific slopes of America cause a more luxurious growth, a greater development of the peripheral parts of the body, and slight changes in coloration. The climatic conditions of the Rocky Mountains and Alps being more alike than those of the White Mountains and Alps, we have certain identical features in the variation of the alpine species of moths of those two ranges of mountains, which are not found in comparing White Mountain and Labrador individuals with those from the Alps of Europe.

It will be seen from the facts we have presented that the moths probably

follow, as regards size, a law the reverse of that established by Professor Baird for the birds and mammals, who shows that they decrease in size southward, though his law of increase in the length of certain peripheral parts westward also obtains in the Lepidoptera. The increase in size westward is, of course, equivalent to the well-known southward increase of size in insects; though in a few species of insects, the Coloradoan and Californian examples are larger than Floridan and Texan insects of the same species.

Of the insects mentioned in the list, *Plusia hochwarti* is the clearest example (1) of the laws of increase in size westward and southward, (2) increase in length of peripheral parts westward; (3) brighter, deeper colors westward.

These facts in the geographical distribution of insects, though they can hardly be called laws until confirmed by a greater number of data drawn from all orders of insects, yet illustrate to my mind how far climatic variation extends as a factor in producing primary differences in faunæ within the same zone of temperature. Varietal and, in some cases, specific differences may have arisen in Asia, Europe, and America from the climatic causes above stated, but still these were in many cases perhaps inadequate in accounting for the present wide distribution of circumpolar species. Here continuity of land, geological as well as meteorological causes, were factors. And so, on the other hand, in accounting for the species and types of genera which distinguish faunæ in zones of similar temperature, geological causes have been the main factor in their production. For instance, we cannot explain the similarity between the insect-fauna of the Pacific States and Colorado and that of Eastern Europe and Central Asia without supposing the original migration of the ancestors of the present circumpolar species from a common source, the supposed Tertiary Arctic continent, and the preservation of their descendants in their present areas through similar climatic and physical causes.

ON THE ORIGIN OF THE PRESENT DISTRIBUTION OF THE PHALENIDÆ OF NORTH AMERICA.

Having attempted to show that the *Phalaenida* of America north of Mexico are composed fundamentally of three elements, viz. of species belonging to the Tropical American, North Temperate American, and Circumpolar realms, we venture to speculate upon the origin of their present mode of distribution. That the tropical American forms in our insect-fauna originally

migrated from Central America by three avenues—*i. e.*, the Pacific coast, the central plateau of the Cordilleras, and the Atlantic coast—no one will probably deny. As regards the present arctic fauna, which is truly circumpolar and scarcely more marked in America than Europe-Asia, and has alpine outliers on the alpine summits of the Ural and Altai ranges of Asia, the Alps of Central Europe, and the mountains of Scandinavia, as well as the elevated coast of the Labrador plateau and the alpine summits of the Alleghany and Rocky Mountains (including the Cascade range and Sierra Nevada of the Pacific coast), we are forced to believe that they have originated in circumpolar lands, and have migrated southward contemporaneously with the advance southward of the glacial climate. It is not improbable that during the height of the glacial period, when it prevailed over a large portion of the north temperate zone, the number of species of insects were greatly in excess of what it is at present, and that the existing arctic land-fauna is but a remnant of what it was in the height of the Quaternary period. As regards the origin of this Quaternary land-fauna, we are naturally led to conclude that it must be the ancient inhabitants of the Tertiary continent of Arctic America and Europe-Asia, of which the Arctic-American Archipelago, Greenland, and Spitzbergen are the remnants. This view is borne out by the fact that not only Tertiary, but even several Cretaceous forms of marine invertebrates, are still living at great depths in the arctic and north temperate seas.

We are now restricted to a consideration of the origin of our north temperate insect-fauna. Here absolute facts are wanting, as no fossil insects common to Temperate and Arctic America have yet been found, and we are thrown back on the facts and speculations afforded by paleontological botanists, referring the reader for the facts as to the identity of certain species in the Miocene Tertiary plants of Europe with those of Spitzbergen and Arctic America to the writings of Heer, who shows that the Miocene "flora of Europe had almost entirely an American character",* and to the results of the studies of the Tertiary and Cretaceous flora of North America by Professor Newberry, and more especially those of Mr. Lesquereux in Hayden's Annual Report of the United States Geological Survey of the Territories for 1872, and his subsequent reports and works published by the Survey.

The results of these studies confirmed certain speculations previously

* "Nordenskiöld, The former Climate of the Polar Regions", in *Geological Magazine*, London, 1875; *American Naturalist*, vol. x, 357, 1876.

made by Prof. Asa Gray.* I quote the abstract of his views given in his "Address".

The singular relations between the Japanese flora and that of North-eastern America gave rise to the speculations which were published "before Heer had developed the rich fossil botany of the arctic zone; before the immense antiquity of existing species of plants was recognized; and before the publication of Darwin's now famous volume on the 'Origin of Species' had introduced and familiarized the scientific world with those now current ideas respecting the history and vicissitudes of species with which I attempted to deal in a moderate and feeble way.

"My speculation was based upon the former glaciation of the northern temperate zone, and the inference of a warmer period preceding and perhaps following. I considered that our own present vegetation, or its proximate ancestry, must have occupied the arctic and subarctic regions in Pliocene times, and that it had been gradually pushed southward as the temperature lowered and the glaciation advanced, even beyond its present habitation; that plants of the same stock and kindred, probably ranging round the arctic zone as the present arctic species do, made their forced migration southward upon widely different longitudes, and receded more or less as the climate grew warmer; that the general difference of climate which marks the eastern and the western sides of the continents—the one extreme, the other mean—was doubtless even then established, so that the same species and the same sort of species would be likely to secure and retain foothold in the similar climates of Japan and the Atlantic United States, but not in intermediate regions of different distribution of heat and moisture; so that different species of the same genus, as in *Torreya*, or different genera of the same group, as *Redwood*, *Taxodium*, and *Glyptostrobus*, or different associations of forest-trees, might establish themselves each in the region best suited to the particular requirements, while they would fail to do so in any other. These views implied that the sources of our actual vegetation and the explanation of these peculiarities were to be sought in, and presupposed, an ancestry in Pliocene or still earlier times, occupying the higher northern regions. And it was thought that the occurrence of peculiarly North American genera in Europe in the Tertiary period (such as *Taxodium*, *Carya*, *Liquidambar*, *Sassafras*, *Noegundo*, &c.) might be best explained on the assumption of early interchange and diffusion through North Asia rather than by that of the fabled Atlantis."

* Memoirs of the American Academy of Arts and Sciences, vi, pp. 477-478, 1870. See also his address at the Dubuque meeting of the American Association for the Advancement of Science, held August, 1872. See also American Naturalist, vi, 171, 1872.

This solution of the problem of the origin of a large proportion of the species of insects of our North Temperate realm was adopted by the writer in an article in the "American Naturalist".* It is evident that the distribution of insects is closely dependent on that of plants, and that the origin of our insect-fauna was contemporaneous and followed the vicissitudes of our flora.

The theory advanced by Heer and others, and still persisted in by authors, of an intercontinental bridge between the temperate zones of America and Europe and America and Asia, besides being opposed by geological reasons of weight, is entirely useless in accounting for the present distribution of insect-life in the temperate zone, as there is a marked absence of Asiatic forms on the Pacific coast, and the presence of what few there are may be accounted for on the hypothesis of their derivation from a Tertiary arctic continent. On the other hand, there are some remarkable features that ally the lepidopterous fauna, at least of the Pacific coast, to that of Europe, and which are wanting in the Eastern or Atlantic province. The presence of the few European temperate forms occurring in temperate America may be explained by the hypothesis of their migration from a Tertiary arctic continent. Indeed, the ancestors of the Pacific-coast *Rhaphidia*, *Parnassius*, *Papilio zolicaon*, *Epicallia*, and *Callaretia*, which are true European-Asiatic types, may have inhabited the arctic Tertiary continent, of which Greenland and Spitzbergen are the remains; and their descendants forced southward have probably lost their foothold in the Atlantic region, and some, like the *Sequoia*, survived in California and others in Europe.

Something more than similarity of climate is required to account for the presence of such generic types, common to the western shores alone of two continents; hence community of origin, with high antiquity, and a southward migration of forms not of tropical origin, are the factors needed to work out the problem.

That something of this sort has taken place in marine animals we know to be the fact. Certain forms, now supposed to be extinct on the coast of New England and Scandinavia, such as *Yoldia arctica* Gray (*Nucula portlandica* Hitchcock), are still living in the seas of Greenland and Spitzbergen.

* July, 1873, vol. vii, 453. See also Proceedings of the Boston Society of Natural History for May 7, 1873, published January, 1874, and an article entitled "On the Geographical Distribution of the Moths of Colorado", from the Annual Report of the United States Geological and Geographical Survey of the Territories for 1873, p. 543 (1875).

The Quaternary fauna of Maine indicates a much more "purely arctic assemblage than is at present to be found." This is also the case with the Scandinavian Quaternary fauna, according to the researches of the late Prof. M. Sars. As we have before shown, in the essay just referred to, the circumpolar marine fauna extends down along the coast of Northeastern America and of Europe, and the forms common to the two shores are circumpolar forms, members of the circumpolar zoölogical realm. Europe, in all probability, did not borrow any of her specific forms from America; but both have been, in part, peopled from a purely circumpolar fauna. If there has been any borrowing, it has been on the part of Europe, since the fossil musk-sheep (*Oribos*) of France and Central Europe is said to be identical with the musk-sheep of arctic America. So, also, on the coast of Northeastern Asia and Alaska are circumpolar forms, which have evidently been borne by arctic currents down each coast. The forms which are identical or representative on those two coasts are species derived from the circumpolar fauna; so the forms which are so strikingly similar in Northern Japan to those on the coast of New England are, if we mistake not, also derived from the northward. From the consideration of these facts, we are led to accept the conclusion that congeneric forms occurring on the Pacific slope of North America, as well as Europe and Asia, are the remnants of a southward migration from polar lands during Tertiary times, and, in proportion to the high antiquity of the migrations, there have been changes and extinctions, causing the present anomalies in the distribution of organized beings which are now so difficult to account for on any other hypothesis. For this reason, it is not improbable that those species of insects which are more or less cosmopolite (and independently so of human agency) are the most ancient, just as some forms taxonomically the most remote are remnants of earlier geological periods. For example, the curious anomalies in the geographical distribution of *Limulus*, the genus only occurring on the eastern coasts of Asia and North America, accord with its isolation from other Crustacea. Geological extinction has gone hand in hand with geographical isolation. It was not an uncommon form in Europe in the Jurassic period, and was preceded by other Merostomata in the Paleozoic periods.

* "Glacial Phenomena of Labrador and Maine," by A. S. Packard, jun., in *Memoirs of Boston Society of Natural History*, 1, 1865.

As regards the Pacific-coast and Coloradian species, which are similar to those inhabiting the plateaus of the Ural and Altai Mountains, such as the two species of *Lithosteg*, *Euaspilates*, and *Caulostoma*, each of these have representatives which do not occur in Northeastern America nor in Western Europe, but are to be found in Central, Southern, and Eastern Europe and Asia Minor, Turkey, and Western Asia, but not in India or Eastern Asia, *i. e.*, China or Japan, so far as yet known. Now, in order to account for this identity of generic types in regions so remote, we are led to suppose that the nearly identical meteorological features of the plateau of Western America and of Asia favored their preservation, their ancestors having migrated from an arctic continent to the northward, while forms, either identical or allied, existing in intermediate areas have become extinct. We may imagine that much the same continuity of life existed, in Mesozoic and Tertiary times, in the ancestors of the inhabitants of the north temperate zone as now exists in the frigid zone, and composing the circumpolar fauna, and that, in fact, this north temperate fauna of the globe was, in Mesozoic and Tertiary times, the then circumpolar fauna.

As regards the theory as to the origin of the European insect-fauna, that of Dr. Jäger seems in part plausible. He considers, according to Hoffmann, that it is composed of three elements: 1. A Glacial fauna, which inhabited Europe during the Glacial period; 2. Species which during the Glacial epoch retired into the Mediterranean region, and which since then have recrossed the Alps; 3. The larger compose a group which originally emigrated from the North of Asia (Siberian fauna). Hoffmann adopts this view for Diurnal Lepidoptera. See an abstract of his views in the Bulletin de la Société entomologique de Belgique, May, 1874. The original is in Württemberger naturwissenschaftliche Jahreshelten, 1873. We have not met with any application, however, of Heer's discoveries and speculations to zoö-geography by European entomologists.

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EXPLANATION OF PLATE I.

- | | |
|--|---|
| FIG. 1. <i>Eupithecia luteata</i> ; 1 <i>a</i> , <i>E. subapicata</i> ; showing the venation of the fore wing. | FIG. 11. <i>Anticlea vasiliata</i> . |
| 2. <i>Glaucopteryx cesiata</i> ; 2 <i>a</i> , <i>G. magnoliata</i> . | 12. <i>Phibalapteryx intestinata</i> . |
| 3. <i>Plenmyria fluviala</i> . | 13. <i>Hydria undulata</i> . |
| 4. <i>Epirrita caubricaria</i> . | 14. <i>Lobophora viridata</i> ; 14 <i>a</i> , <i>L. montanata</i> , portion of wing, showing abnormal venation. |
| 5. <i>Thera contractata</i> . | 15. <i>Carsia paludata</i> . |
| 6. <i>Hydriomena trifasciata</i> . | 16. <i>Odesia albovittata</i> . |
| 7. <i>Petrophora truncata</i> ; 7 <i>a</i> , <i>P. diversilineata</i> ; 7 <i>b</i> , <i>P. flavicata</i> . | 17. <i>Helionata cycladata</i> . |
| 8. <i>Ochyria ferrugaria</i> ; 8 <i>a</i> , <i>O. designata</i> ; 8 <i>b</i> , <i>O. lignicoloraria</i> . | 18. <i>Heterophelps triguttata</i> . |
| 9. <i>Rhemaptera ruficillata</i> . | 19. <i>Lithostege rotundata</i> . |
| 10. <i>Rhemaptera hastata</i> . | 20. <i>Operihophtera boreata</i> . |

The figures on this plate were mostly drawn, with the aid of the camera, by the author; a few by S. E. Cassino. In plates 1-7, the figures are not drawn to the same scale.

EXPLANATION OF PLATE II.

FIG. 1. *Gorytodes uncanaria*.

2. *Euaspilates spinataria*.

3. *Aspilates pervaria*.

4. *Tornos rubiginosaria*.

5. *Zerene catenaria*.

6. *Haematopis grataria*.

7. *Lythua rilexaria*.

8. *Loxodidonia acidaliata*.

9. *Eufidonia notataria*.

FIG. 10. *Perconia finetaria*.

11. *Fidonia truncataria*; 11 *a*, portion enlarged.

12. *Ematurga faxoniaria*.

13. *Dasyfidonia avuncularia*.

14. *Orthofidonia exornata*.

15. *Canipeta divisaria*.

16. *Selidosema juturnaria*.

17. *Lozogramma delnata*; 17 *a*, *b*; 17 *b*, L. nigroscutata.

The figures on this plate were drawn on stone, with the aid of the camera, by S. E. Cassino.

EXPLANATION OF PLATE III.

FIG. 1. *Eufitehna ribeata*.

2. *Thamnonoma wavaria*; 2 *a*, *T. argillacea*;
2 *b*, *T. brummaria*.

3. *Marmopteryx marmorata*.

4. *Psammotodes eremita*.

5. *Phasiane atrofasciata*; 5 *a*, *P. irrorata*.

6. *Semiothisa bisignata*; 6 *a*, *S. granitata*.

7. *Eumacaria brummaria*.

8. *Corycia vestahata*; 8 *a*, *C. semiclarata*.

9. *Eudeilinia hemimbiata*.

10. *Deilinia erythemaria*.

FIG. 11. *Gueneria basiata*.

12. *Stegania pustularia*.

13. *Goniacidalia furciferata*.

14. *Calledapteryx crosiata*.

15. *Eumacidalia sericeata*.

16. *Eois gemmata*. The 2d and 3d subcostal
venules should be as in fig. 17.

17. *Eois ferruginata*. The cell is sometimes as
open as in *gemmata*.

18. *Calothysanis amaturlaria*.

The figures in this plate were drawn on stone, with the aid of the camera, by S. E. Cassino.

EXPLANATION OF PLATE IV.

FIG. 1. *Ceratodalia gueneata*.

2. *Asthena albogilvaria*.

3. *Acidalia enucleata*; 3 *a*, *A. insulsaria*; 3 *b*, *A. insulsaria*; 3 *c*, *A. caemminata*; 3 *c*, *A. ossulata*.

4. *Ephyra pendulinaria*.

5. *Enephyra serrulata*.

6. *Dyspteris abottivaria*.

7. *Eucrostis chlorolencaria*.

8. *Nemoria pistaciata*; 8 *a*, *N. gratata*.

9. *Synchlora rubivornia*.

FIG. 10. *Annemoria unitaria*.

11. *Chlorosea nevadaria*.

12. *Synchlora excurvaria*.

13. *Aplodes mimosaria*.

14. *Geometra iridaria*.

15. *Anisopteryx vernata*.

16. *Phigalia strigataria*.

17. *Hibernia filiaris*.

18. *Enbyja cognataria*.

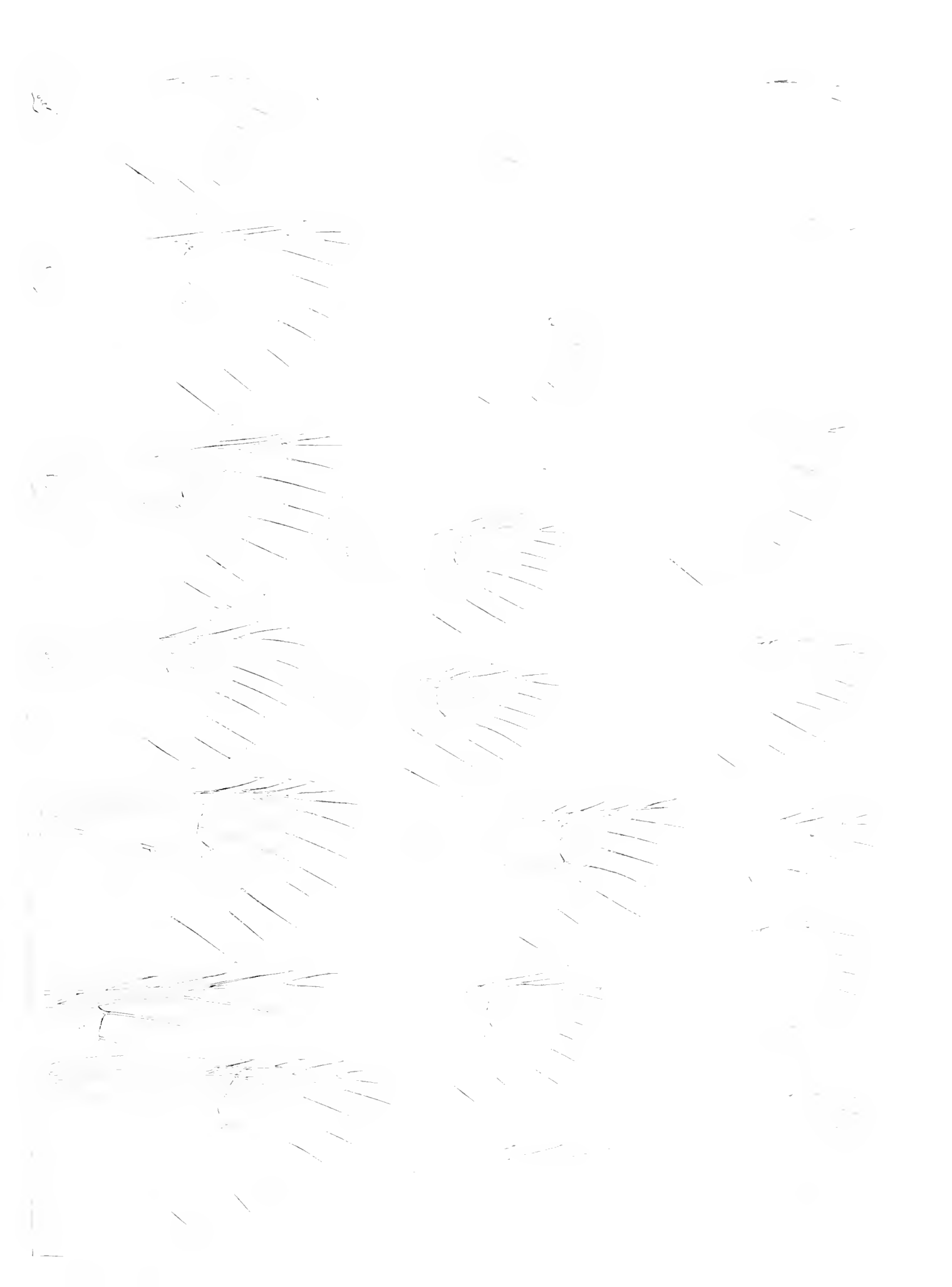
19. *Paraphia subatomaria*.

The figures on this plate were drawn on stone, with the aid of the camera, by S. S. Cassino.

EXPLANATION OF PLATE V.

- | | |
|---|--|
| FIG. 1. <i>Paraphia subatomaria</i> . | FIG. 10. <i>Nematocampa filamentaria</i> . |
| 2. <i>Teplrosia canadaria</i> ; 2 <i>a</i> , <i>Cymatophora</i> | 11. <i>Metrocampa perlata</i> . |
| <i>psilogrammaria</i> ; 2 <i>b</i> , <i>Teplrosia californica</i> | 12. <i>Heterolocha edwardsata</i> . |
| <i>ria</i> ; 2 <i>c</i> , <i>Teplrosia antiearia</i> . | 13. <i>Carlostoma occiduaria</i> . |
| 3. <i>Cymatophora umbrosaria</i> . | 14. <i>Sicya reticularia</i> . |
| 4. <i>Brachelia hortaria</i> . | 15. <i>Angerona coccinaria</i> . |
| 5. <i>Gnophos haydenata</i> . | 16. <i>Antepione depontanata</i> . |
| 6. <i>Heimerophila unitaria</i> . | 17. <i>Anagoga pulveraria</i> , small <i>?</i> |
| 7. <i>Stenotrachelys pennsylvanica</i> . | 18. <i>Tetracis truxaliata</i> . |
| 8. <i>Hyperetis nyssaria</i> . | 19. <i>Tetracis agrotata</i> . |
| 9. <i>Plagodis seminaria</i> . | |

The figures on this plate were drawn on stone, with the aid of the camera, by S. E. Cassino.



EXPLANATION OF PLATE VI.

FIG. 1. *Thema fervidaria*.

2. *Epitheca crocallata*.

3. *Chloris pulchraria* (var. *pellucidaria*).

4. *Metanema quercivoraria*.

5. *Opisthograptis ochreata*.

6. *Endropia serrataria*.

7. *Eugonia obsignaria*.

8. *Epiranthus obliquaria*.

9. *Aspilates libanaria*.

10. *Endropia bilinearia*.

11. *Drepanodes varius*.

12. *Archon bilineata*.

13. *Endropia armataria*.

14. *Endropia hypocharia*.

15. *Caberodes confusaria*.

FIG. 16. *Caberodes cervinaria*.

17. *Selenia kentaria*.

18. *Entropeta transversata*.

19. *Epithecia misculata*, head denuded.

20. *Caripeta divisaria*, head denuded, showing the ocelli.

21. *Acidalia 4-lineata*: head, showing the ocelli.

22. *Eucrostis chlorolencaria*: head, showing the ocelli.

23. *Cynatophora crepuscularia*, head.

24. *Entropeta transversata*, head, *oe*, ocelli; *e*, epieranium; *c*, clypeus; *lb*, labrum; *md*, mandible max. maxilla.

25. *Cydmon leilus*: head, showing the ocelli.

The figures on this plate were drawn, with the aid of the camera, by S. E. Cassino.

EXPLANATION OF PLATE VII.

- FIG. 1-8. Transformations of a Tineid moth, see p. 37.
9. Thorax of *Pterophorus marginidactylus*; 9 *a*, dorsal view.
10. Thorax of the European *Scardia boleti*; 10 *a*, dorsal view.
11. Thorax of *Tortrix* sp.; 11 *a*, dorsal view.
12. Thorax of *Botys* sp.; 12 *a*, dorsal view.
13. Thorax of *Anisopteryx vernata* ♂; 13 *a*, dorsal view.
14. Thorax of *Anisopteryx vernata* ♀; 14 *a*, dorsal view.
15. Thorax of *Hadena destructor*; 15 *a*, dorsal view.
16. Thorax of *Telea polyphemus*; 16 *a*, dorsal view.
17. Thorax of an European *Zygena*; 17 *a*, dorsal view.
18. Thorax of *Egeria scitula*; 18 *a*, dorsal view.
- FIG. 19. Thorax of *Deilephila lineata*; 19 *a*, dorsal view.
20. Thorax of *Vanessa atalanta*; 20 *a*, dorsal view.
21. Thorax of *Eutrapela transversata*; 21 *a*, dorsal view; 21 *b*, front view of prothorax; 21 *c*, front view; 21 *d*, posterior view of mesothorax; 21 *e*, front; 21 *f*, posterior view of the metathorax.
22. Palpus (denuded) of *Petrophora diversifilicata*.
23. Palpus of *Ochyria ferrugaria*.
24. Male genital armature of *Petrophora truncata*, lateral view; 24 *a*, ventral; 24 *b*, dorsal view; *p*, penis; *pl*, supraanal plate; *l*, *c*, lateral claspers.
25. *Anisopteryx vernata*; ♂, head.
26. *Anisopteryx vernata*; ♀, head.

All except figs. 1-8 drawn on stone, with the camera, by S. E. Cassino.

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EXPLANATION OF PLATE VIII.

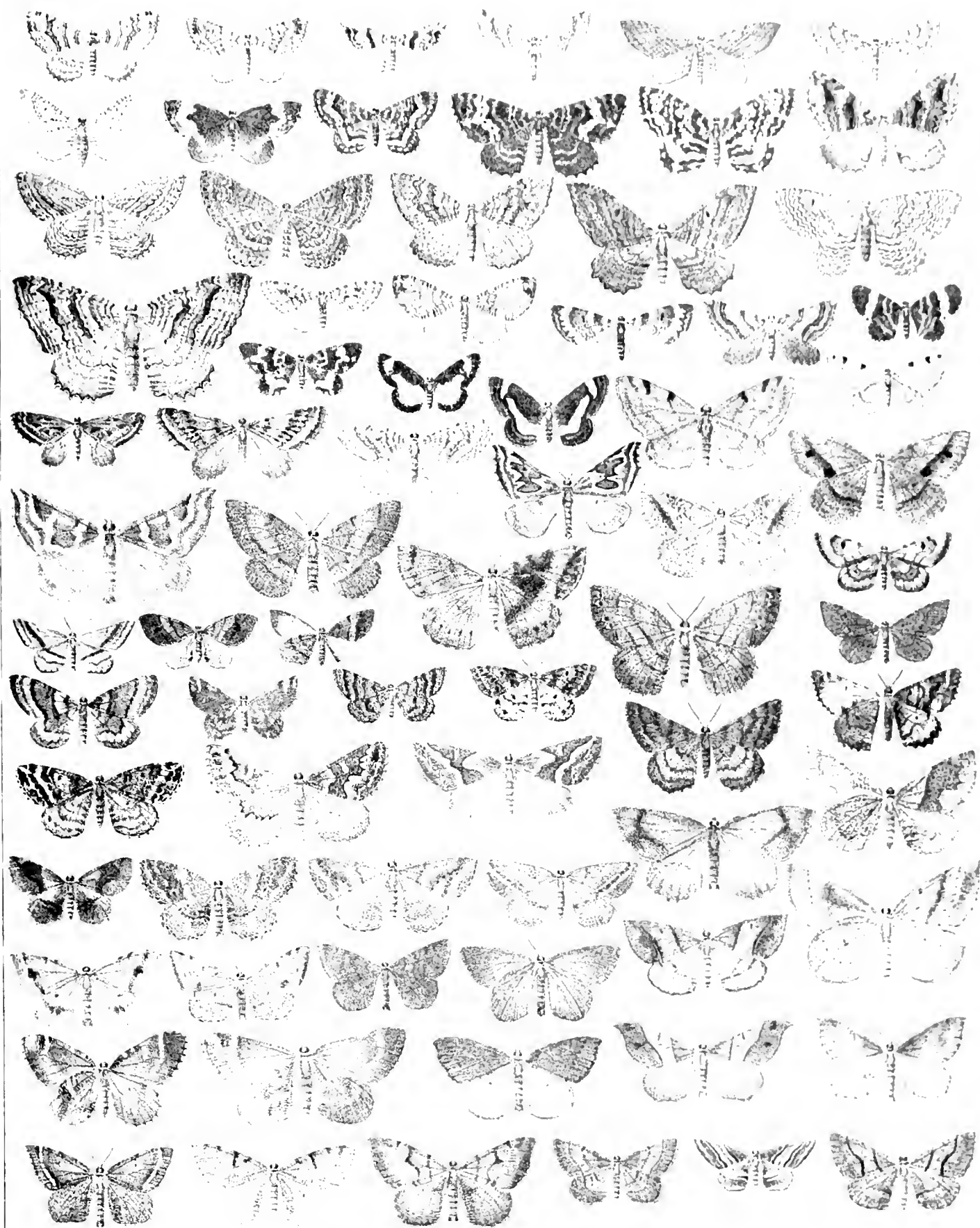
- | | |
|--|--|
| <p>FIG. 1. <i>Eupithecia albicapitata</i>.
 2. absynthiata.
 3. absynthiata var.
 4. niserulata.
 5. niserulata var. interruptos-
 ciata.
 6. reticulopunctata.
 7. luteata.
 8. stratocoma.
 9. raycoostaliata.
 10. nevadata.
 11. subapicata.
 12. 13. <i>Lophophora angulilineata</i>.
 13. <i>Lophophora verna</i>.
 14. geminata.
 15. <i>Glaucopteryx eteaceata</i>.
 16. coxiata.
 17. mangulata.
 18. implicata.
 19. polata.
 20. sabiniaria.
 21. phocata.
 22. <i>Phymata multilincata</i>.
 23. flaviata $\frac{1}{2}$.
 24. flaviata $\frac{7}{8}$.
 25. <i>Epirrita perlincata</i>.
 26. 12-lincaria.
 27. canibricaria.
 28. <i>Thera contractata</i>.
 29. <i>Hydriomena trifasciata</i>.
 30. californiata, normal form.
 31. sordidata var.
 32. californiata var.
 33. californiata.
 34. sordidata var.
 35. sordidata, normal form.
 36. 5-fasciata.
 37. speciosata.
 38. <i>Petrophora truncata</i>, normal form.</p> | <p>FIG. 39. <i>Petrophora truncata</i> var.
 40. truncata var.
 41. hirsiliata.
 42. hirsiliata var.
 43. emigerata.
 44. leopliata.
 45. manicipata.
 46. prunata var. nubilata.
 47. prunata, normal form (desti-
 nata).
 48. prunata var. lugubrata.
 49. atrocolorata.
 50. albolincata.
 51. testata.
 52. populata.
 53. diversilincata.
 54. diversilincata var. gracilincata.
 55. flaviceata.
 56. parinotata.
 57. <i>Ochyria abrasaria</i>.
 58. abrasaria when rubbed.
 59. lignicoloraria.
 60. gueneata.
 61. rubrosuffusata.
 62. ferrugaria.
 63. designata.
 64. <i>Phibalapteryx latirupta</i>.
 65. latirupta var.
 66. munitaria.
 67. munitaria var.
 68. <i>Epirrita 12-lincaria</i>.
 69. <i>Rhenanaptera brunneicellata</i>.
 70. ruficellata.
 71. fluctuata.
 72. fluctuata var.
 73. intermediata.
 74. laeustrata.
 75. unangulata.</p> |
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EXPLANATION OF PLATE IX.

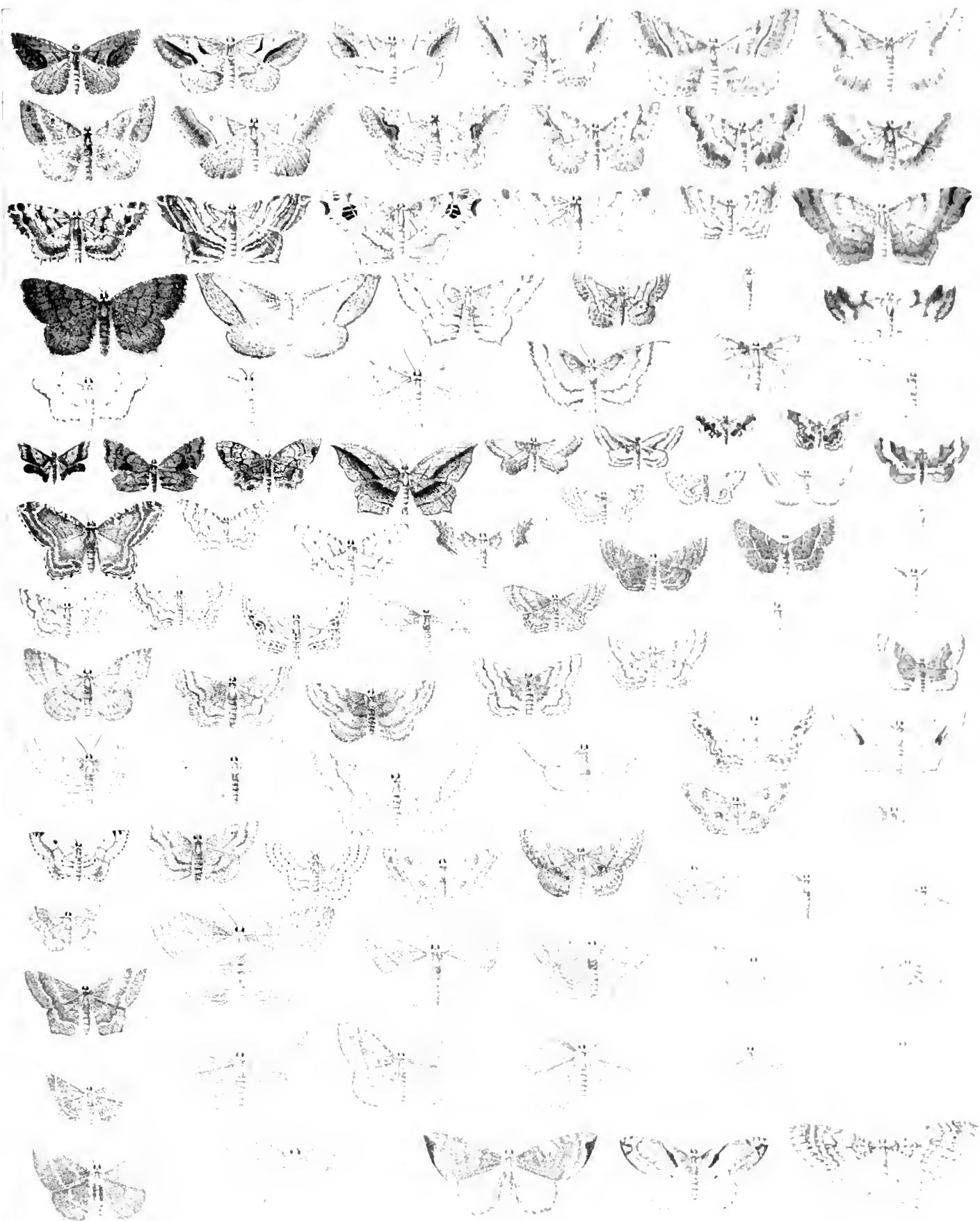
- FIG. 1. *Rhenmaptera intermediata* ♂
 2. *basaliata* ♂
 3. *Ochyma lacteata*.
 4. *carneata* ♂
 5. *Eupithecia behrensata* ♀
 6. *longipalata* ♂
 7. *zygadeniata* ♀
 8. *Rhenmaptera lugubrata*.
 9. *tristata*.
 10. *hastata* ♀
 11. *hastata* var. ♀
 12. *Anticlea vasiliata* ♀
 13. *Phibalapteryx intestinata* ♀
 14. *Philereme albosignata* ♀
 15. *californiata* ♀
 16. *mediata* ♀
 17. *Hydria undulata* ♀
 18. *Triphosa dubitata* ♂
 19. *Lobophora vundata* ♂
 20. *inequaliata*.
 21. *montanata* ♀
 22. *Carsia paludata*.
 23. *Baptina alboviridata* ♂
 24. *californiata* ♀
 25. *Helionata cycladata* ♂
 26. *infalata* ♀
 27. *Heterophleps barviciata* ♀
 28. *triguttata* ♂
 29. *Lathostege rotundata* ♂
 30. *triseriata* ♂
 31. *Operophtera boreata* ♂
 32. *Galytodes uncanaria* ♂
 33. *trilinearia* ♂
 34. *Aspilates pervaria* ♂
 35. *coloraria* var. ♂
 36. *coloraria*.
 37. *littneraria* var. ♂
 38. *littneraria*, normal form ♂
 39. *Tornos rubiginosaria* ♂

- FIG. 40. *Tornos approximaria* ♂
 41. *Hematops grataria* ♂
 42. *Lythria snowiaria* ♀
 43. *rilevata*.
 44. *Loxofidonia acidaliata* ♂
 45. *Pereonia finetaria* ♂
 46. *Fidonia truncataria* ♂
 47. *Entidonia notataria* ♂
 48. *Ematurga fixonaria*.
 49. *Dasyfidonia avunculata* ♂ (left side, as
 seen from beneath).
 50. *Orthofidonia exornata* ♂
 51. *Caripeta divisata* ♂ (left side, as seen from
 beneath).
 52. *Caripeta angustiorata* ♂
 53. *Schidosema juturnaria* ♀
 54. *Anagoga pulveraria* ♀
 55. *pulvataria* ♂ (left side reversed).
 56. *Lozogramma disconventa* ♂
 57. *detersata* ♂
 58. *atropunctata* ♂
 59. *defluata* ♂
 60. *nigrescensata* ♂ (left side, as
 reversed).
 61. *Enitelia ribeata* ♂
 62. *Thamnonoma sulphuraria* ♂
 63. *brunnea* ♂
 64. *argillacearia* ♂
 65. *Mamepteryx strigulata* ♂
 66. *mammolata* ♂
 67. *Tephrosia taleataria* ♂
 68. *Thamnonoma tripunctaria* ♂
 69. *marcescens* ♂
 70. *guenearia* ♂
 71. *successaria* ♀
 72. *wavaria* ♂
 73. *Psamatodes eremiata* ♀
 74. *Phasione atrofasciata* ♀
 75. *orillata* ♀



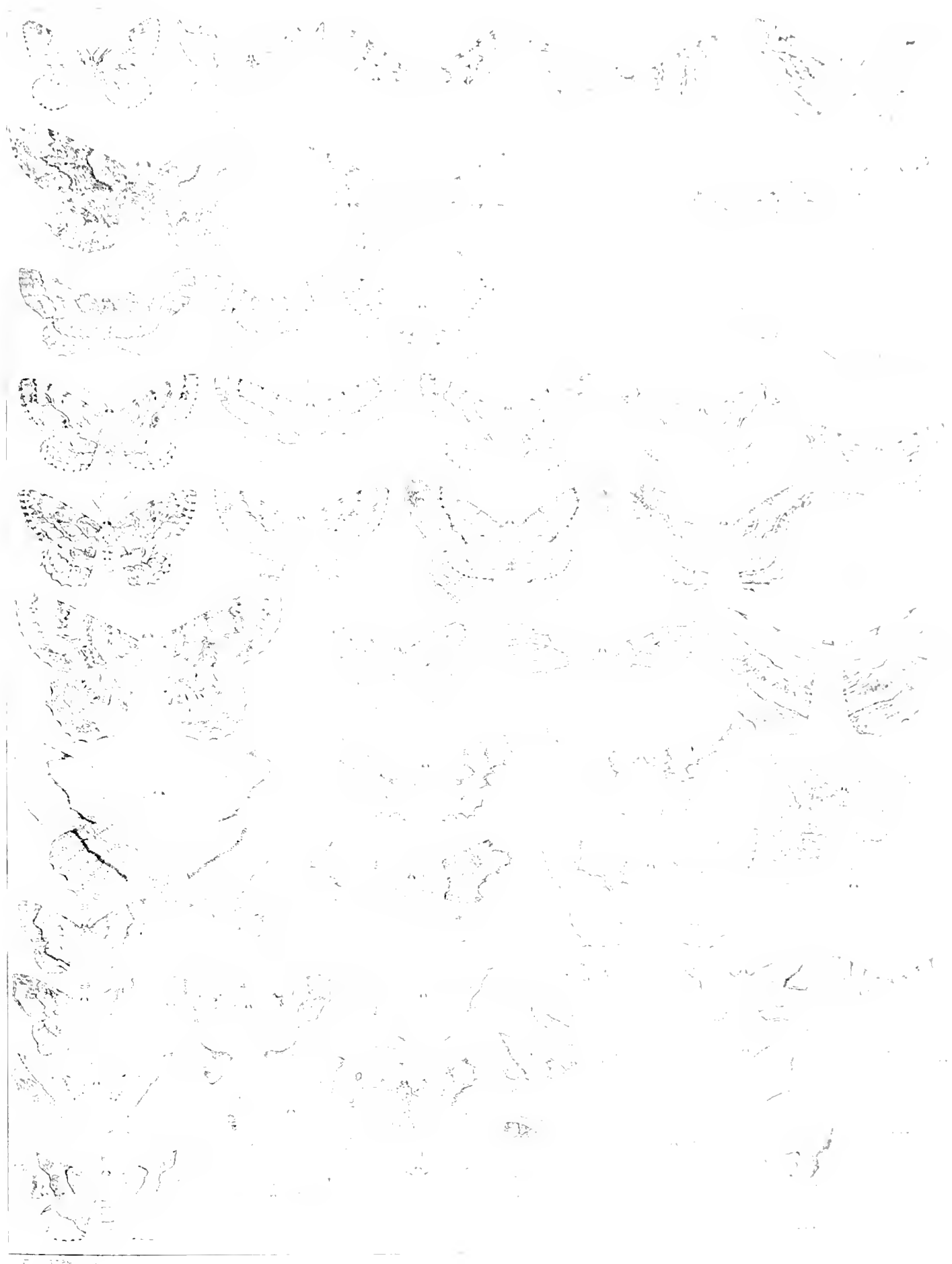
EXPLANATION OF PLATE X.

- FIG. 1. *Phasme snoviata* ♂
 2. *mediata* ♂
 3. *mellictrigata* ♂
 4. *trifasciata* ♂
 5. *sinuata* ♂
 6. *saliciniata* ♂
 7. *irrorata* ♂
 8. *neptata* ♂
 9. *Semiothisa* ssgnata ♀
 10. *informata* ♂
 11. *ocellinata* ♂
 12. *punctolineata* ♂
 13. *granitata* ♂
 14. *multilineata* ♂
 15. *enotata* ♂
 16. *basignata* ♂
 17. *minorata* ♂
 18. *praetomata* ♂
 19. *distributaria* ♀
 20. *Lozogramma extremaria* (from drawing of Walker's type).
 21. *Semiothisa aquiferaria* (copied from Walker's type).
 22. *Emmeaeria brunnearia* ♂
 23. *Corycia vestaliata* ♂
 24. *semiclarata* ♀
 25. *Enderlinia herminia* ♂
 26. *Delinia variolaria* ♂
 27. *erythemaria* ♂
 28. *pacificaria* ♂
 29. *Gueneria basiata* ♂
 30. *Stegania pustulata* ♂
 31. *Goniacidalia fusciferata* ♂
 32. *Calledapteryx dryopterata* ♂
 33. *Callizzia amorata* ♂
 34. *Calothysanis amaturnaria* ♂
 35. *Emacidalia sericeata* ♂
 36. *floridata* ♂
 37. *Eois gemmata* ♂
 38. *occidentata* ♂
 39. *terangata* ♂
 40. *Ceratodalia gueneata* ♂
 41. *Asthena alboglypta* ♂
 42. *brunneifasciata* ♂
 43. *lucata* ♂
 44. *Acidalia ossulata* ♂
 45. *granitata* ♂
 46. *perirrorata* ♂
 47. *longipennata* ♂
 48. *Acidalia peralbata* ♂
 49. *punctolineata* ♂
 50. *caecinnata* ♂
 51. *productata* ♂
 52. *insulsaria* ♂
 53. *pamaria* ♂
 54. *albocostata* ♀
 55. *rotundopennata* ♂
 56. *nivosata* ♂
 57. *rubromarginata* ♂
 58. *inductata* ♂
 59. *spuraria* ♂
 60. *californiata* ♂
 61. *sentinaria* ♂
 62. *rubrolineata* ♂
 63. *subalbata* ♂
 64. *quadrilineata* ♂
 65. *quinquelineata* ♂
 66. *ordinata* ♂
 67. *enneleata* ♂
 68. *timandrata*.
 69. *compensata*.
 70. *impanperata*.
 71. *tacturata*.
 72. *Ephyra pendulinaria* ♂
 73. *myrtaria* ♂
 74. *Euephyra serrulata* ♂
 75. *Dyspteris abortivaria* ♂
 76. *Eucrostis zelleraria* ♂
 77. *chloroleucaria* ♂
 78. *Nemoria suberocata* ♂
 79. *gratata* ♀
 80. *pistachiata*.
 81. *Chlorosea nevadaria* ♂
 82. *pervividaria* ♂
 83. *Synchlora tricoloraria* ♀
 84. *albolinearia* ♀
 85. *exenrvaria* ♂
 86. *rubivorata* ♂
 87. *Aplodes rubrifrontaria* ♂
 88. *brunneata* ♀
 89. *minosaria* ♂
 90. *rubrolineata* ♂
 91. *latiaria* ♂
 92. *approximaria* ♀
 93. *Geometra iridaria* ♀
 94. *Cidaria remotata* (from Walker's type).
 95. *Larentia cervinifascia* (from Walker's type).
 96. *Epirrita dilutata* ♂



EXPLANATION OF PLATE XI.

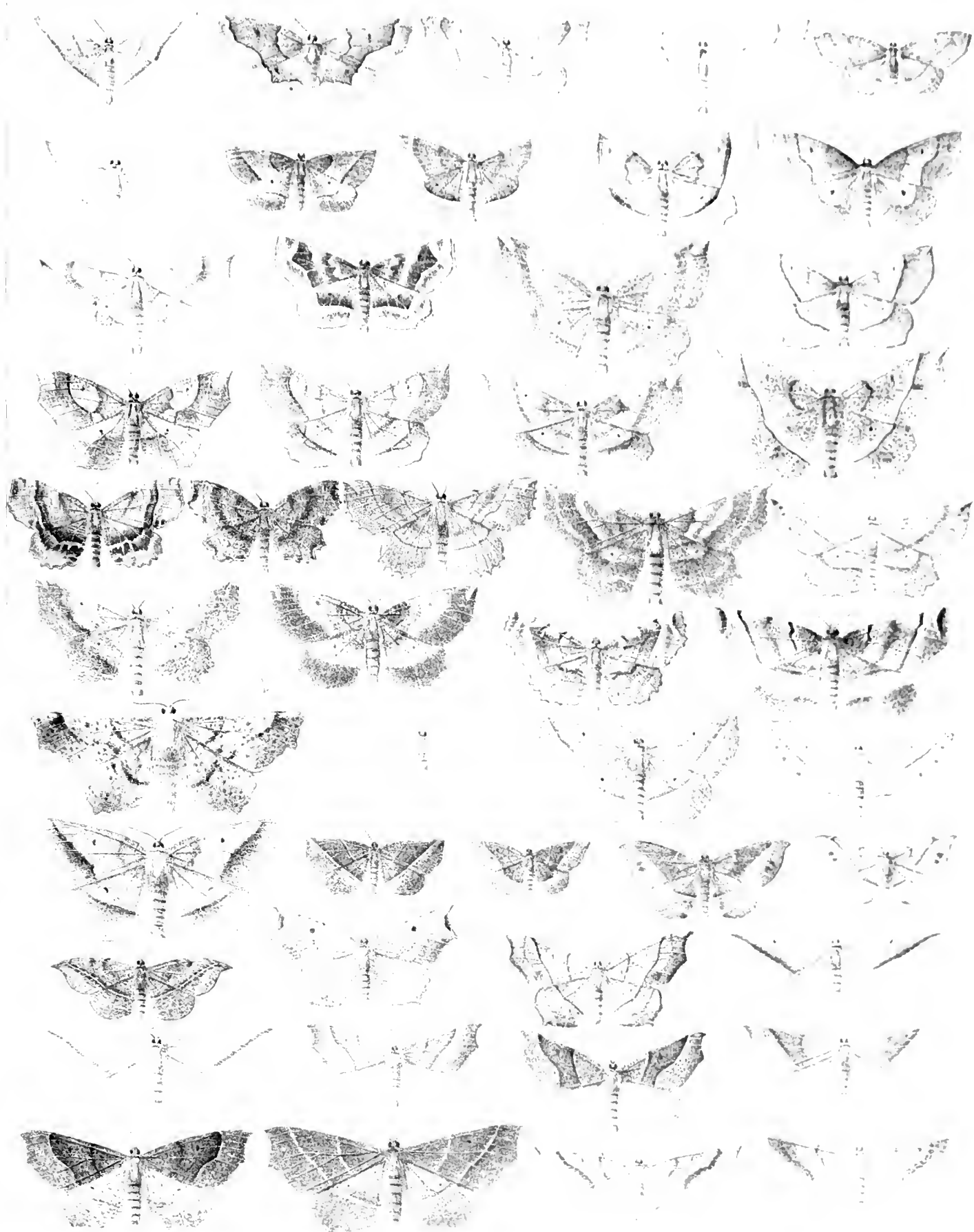
- | | |
|---|--|
| <p>FIG. 1. <i>Anisopteryx autumnata</i> ♂</p> <p>2. <i>vernata</i> ♂</p> <p>3. <i>Phigalia strigataria</i> ♂</p> <p>4. <i>Amphidastis cognataria</i> ♂</p> <p>5. <i>cupidaria</i> ♂ (after Grote).</p> <p>6. <i>quercuaria</i> ♀</p> <p>7. <i>Biston ursaria</i> ♂</p> <p>8. <i>Paraphia subatomaria</i> ♂</p> <p>9. <i>deplanaria</i> ♂</p> <p>10. <i>unipunctata</i> ♀</p> <p>11. <i>Tephrosia cognataria</i> ♂</p> <p>12. <i>anticaria</i> ♂</p> <p>13. <i>cribrataria</i> ♂</p> <p>14. <i>canadaria</i> ♂</p> <p>15. <i>californiaria</i> ♂</p> <p>16. <i>Cymatophora psilogrammaria</i> ♂</p> <p>17. <i>plumosaria</i> ♂</p> <p>18. <i>quinque-linearia</i> ♂</p> <p>19. <i>polygrammaria</i> ♂</p> <p>20. <i>pampinaria</i> ♂</p> <p>21. <i>larvaria</i> ♂</p> <p>22. <i>humaria</i> ♂</p> <p>23. <i>umbrosaria</i> ♂</p> <p>24. <i>crepuscularia</i> ♂</p> <p>25. <i>californiaria</i> ♀</p> <p>26. <i>Bronchelia lontanata</i> ♂</p> <p>27. <i>Gnophos haydenata</i> ♂</p> <p>28. <i>Hemiophiola latifasciaria</i> ♂</p> <p>29. <i>mutaria</i> ♂</p> <p>30. <i>Stenotrachelys approximata</i> ♂</p> <p>31. <i>permagnaria</i> ♀</p> | <p>FIG. 32. <i>Cleora pulchraria</i> ♂</p> <p>33. <i>umbrosaria</i> ♂</p> <p>34. <i>nigrovenaria</i> ♀</p> <p>35. <i>pulchraria</i> var. ♀</p> <p>36. (Wanting.)</p> <p>37. <i>Hyperetis nyssaria</i> var.</p> <p>38. var. ♂</p> <p>39. var. ♀</p> <p>40. typical form ♂</p> <p>41. <i>Plagodis alceolaria</i> ♀</p> <p>42. <i>phlogosaria</i> ♀</p> <p>43. <i>fervidaria</i>.</p> <p>44. <i>kentzingaria</i> ♂</p> <p>45. <i>serinaria</i> ♂</p> <p>46. <i>Nematocampa filamentaria</i> ♀</p> <p>47. <i>Opisthograptis ochreata</i> ♂</p> <p>48. <i>Heterolocha edwardsata</i> ♀</p> <p>49. <i>Thauntonoma flavicaria</i> ♂</p> <p>50. <i>Sicya macularia</i> ♂</p> <p>51. from a Californian example, <i>crocearia</i> ♂</p> <p>52. <i>Angerona crecataria</i> ♂</p> <p>53. <i>Caberodes cayennaria</i> ♂</p> <p>54. <i>Aspilates liberaria</i> ♀</p> <p>55. <i>Antepione depontanata</i> ♂</p> <p>56. <i>sulphurata</i> ♀</p> <p>57. <i>Epione mollicularia</i> ♂</p> <p>58. <i>Azelma hibernata</i> ♂</p> <p>59. <i>hibernata</i> ♀</p> <p>60. <i>beltronsata</i> ♂</p> |
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EXPLANATION OF PLATE XII.

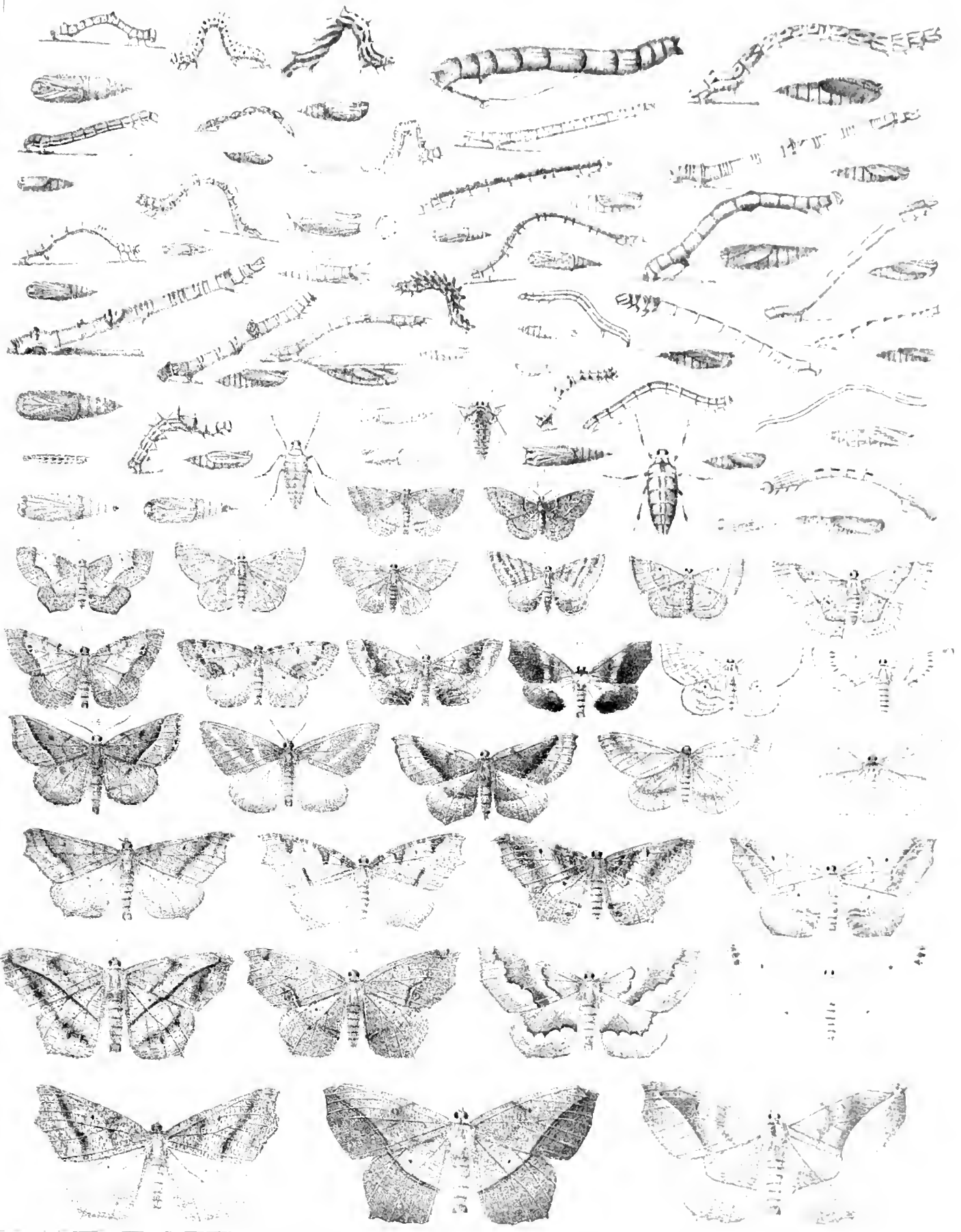
- FIG. 1. *Metrocampa perlaria* ♂
 2. *Therina fervidaria* ♂ normal form.
 3. *fervidaria* of Hilbner.
 4. *seminudaria* ♂
 5. *seminudaria* var. ♀
 6. *endropiaria* ♀
 7. *Epiranthia obliquaria* ♂
 8. *Endropia pilosaria* ♀
 9. *apicaria* ♂
 10. *duaria* ♂
 11. *pectinaria* ♂
 12. *hypochraria* ♂
 13. *marginaria* ♂
 14. *vinulentaria* ♂
 15. *texturaria* ♂
 16. *madusaria* ♂
 17. *amoenaria* ♂
 18. *pectinaria* ♀
 19. *armataria* ♂
 20. *armataria* ♂ var.
 21. *lilincaria* ♂
 22. *effictaria* ♂
 23. *obtusaria* ♂
 24. *effictaria* ♂

- FIG. 25. *Endropia serrataria* ♂
 26. *Selenia kentaria* ♂
 27. *adeiphearia* ♂
 28. *Eugonia alniaria* ♂
 29. *subsignaria* ♂
 30. *Caberodes confusaria* var. *metrocampata* ♂
 31. *confusaria* ♂
 32. *majoraria* ♂
 33. *Metanema canuaria* ♂
 34. *Caberodes cervinaria* ♀
 35. *Drepanodes puber* ♂
 36. *varus* ♂
 37. *varus* ♀
 38. *Metanema inattonaria* ♀
 39. *quercivoraria* ♀
 40. *Tetracis crocallata* ♂
 41. *lorata* ♂
 42. *parallelaria* ♂
 43. *parallelaria* ♀
 44. *aurantiacaria* ♀ var.
 45. *aurantiacaria* ♀ normal form.
 46. *cervinaria* ♀
 47. *coloradaria* ♂
 48. *grotearia* ♂



EXPLANATION OF PLATE XIII.

- FIG. 1. *Engonia subsignaria*, larva; 1 *a*, pupa of *E. alniaria*.
 2. *Entitchia ribeata* (after Trouvelot).
 3. *Tornos rubiginosaria*, larva; 3 *a*, pupa (after Abbot MS.).
 4. Undetermined larva feeding on willow (after Trouvelot).
 5. *Endropia obtusaria*, larva (after Abbot, MS. drawing).
 6. *Anisopteryx vernata*, larva, from Guide to Study of Insects, 6 *a*, pupa of *Anisopteryx*, species undetermined.
 7. *Plenyrria fluvicola*, larva; 7 *a*, pupa, after Millere.
 8. *Nematocampa filamentaria*, larva; 8 *a*, pupa (Guide to Study of Insects).
 9. *Angelona croceataria*, larva (Guide to Study of Insects).
 10. *Endropia texturaria*, larva; 10 *a*, pupa (Abbot, MS.).
 11. *Petrophora diversilineata*, larva (a poor copy from Guide to Study of Insects).
 12. *Zerene catenaria*, larva (after Trouvelot).
 13. *Cleora pulcherraria*, pupa.
 14. *Ephyria pendulinaria*, pupa; 14 *a*, dorsal view (after Sendler).
 15. *Cymatophora humaria*, larva (Abbot, MS., see fig. 21).
 16. *Acidalia ordinata*, larva; 16 *a*, pupa (Abbot, MS.).
 17. *Cymatophora larvaria*, pupa.
 18. *Caberodes confusaria*, larva; 18 *a*, pupa (Abbot, MS.).
 19. *Hyperetis nyssaria*, larva; 19 *a*, pupa (Abbot, MS.).
 20. *Entrapela transversata*, larva (Abbot, MS.); 20 *a*, pupa from nature.
 21. ? *Cymatophora humaria*, larva; 21 *a*, pupa (Abbot, MS.).
 22. *Arrhestia lumenaria* (after Abbot, MS.). This larva is probably not a *Cymatophora*; there seems to be no doubt but that fig. 15 is the young of *C. humaria*.
 23. *Synchlora excurvaria*?, larva (Abbot, MS.).
 24. *Semiothisa enotata*, larva; 24 *a*, pupa (Abbot, MS.).
 25. *Hyperetis nyssaria*, larva, bis (Abbot, MS.).
 26. *Acidalia cuneolata*, larva; 26 *a*, pupa (Abbot, MS.).
 27. *Eupithecia miserulata*, larva; 27 *a*, pupa (after Cassino).
 FIG. 28. *Aplodes brunnearia*, larva; 28, pupa (Abbot, MS.).
 29. *Tetracis lorata*, pupa, from nature.
 30. *Drepanodes varus*, pupa, dorsal and lateral view (after Emerton). See p. 43.
 31. Larva of 46, species near *Synchlora excurvaria* (after Abbot, MS.).
 32. *Acidalia insulsaria*, pupa (from nature).
 33. *Stegania pustularia*, larva; 33 *a*, pupa (Abbot, MS.).
 34. *Therma fervidaria*, larva; 34 *a*, pupa (Abbot, MS.).
 35. *Aspilates dissimilaria*, larva; 35 *a*, pupa (Abbot, MS.).
 36. *Cymatophora larvaria*, pupa, bis, same as fig. 17.
 37. *Phigalia strigularia* ♀
 38. *Anisopteryx autumnata* ♀
 39. *vernata* ♀
 40. *Chloraspilates bicoloraria* ♂
 41. *Synchlora excurvaria*?, reared from fig. 23 (Abbot, MS.).
 42. *Hyperetis nyssaria* var. *nepiasaria* Walk. (from Walker's type).
 43. *Aplodes* sp. ? (Abbot, MS.).
 44. *Aplodes rubromarginaria* ♀
 45. *Phasiane nubeculata* ♂
 46. Near *Synchlora excurvaria* (Abbot, MS.).
 47. *Aplodes brunnearia* ♀ (Abbot, MS.).
 48. *Semiothisa dislocata* ♂
 49. *Thamnomoma flavicaria* ♂
 50. *Stenaspilates meskearia* ♂
 51. *Plagodis kentzingaria* ♂
 52. *Acidalia restrictata* ♂ (from Walker's type).
 53. *Aspilates atropunctaria* (do.).
 54. *Caberodes antidiscaria* ♂ (do.).
 55. *Chlorosea bistriaria* ♂
 56. *Azelina zalissaria* (from Walker's type).
 57. *Napaea oreiferaria* ♂ (from Walker's type).
 58. *Anaplodes pistaciaria* ♂
 59. *Tetracis truxaliata* ♂
 60. *trianguliferaria* ♂
 61. *Entrapela nubilata* ♀
 62. *nubilata* ♂
 63. *transversata* ♂
 64. *fureiferata* var. ♂
 65. *Tetracis agrotata* ♂
 66. *Entrapela falcata* ♂
 67. *Tetracis truxaliata* ? bis.
 68. *Entrapela transversata* ♂ var.
 69. *clematata* ♂



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